(FRONTISPIECE.)

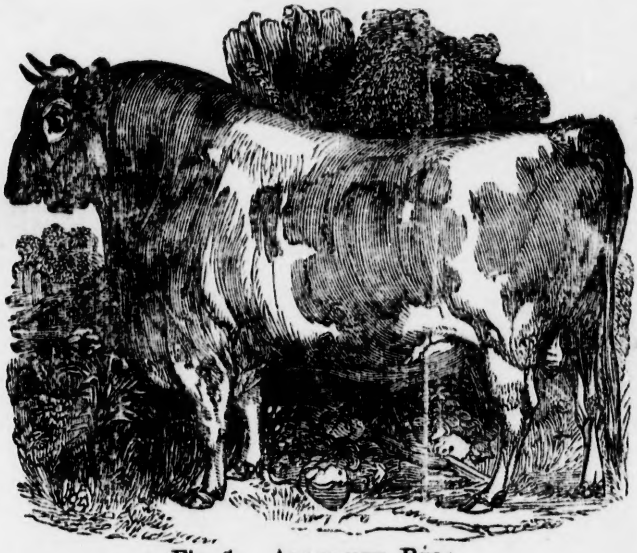

Fig. 1. ALDERNEY BULL.

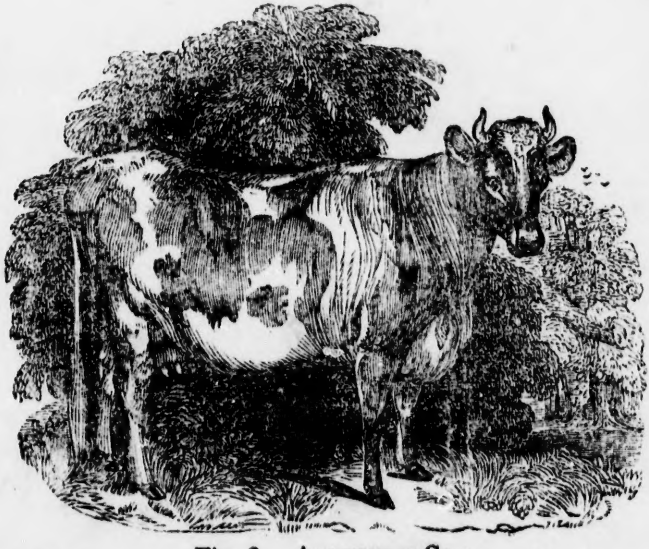

Fig. 2. ALDERNEY COW.

CONTRIBUTIONS

TOWARD THE

IMPROVEMENT OF AGRICULTURE

IN

NOVA-SCOTIA;

WITH

PRACTICAL HINTS

ON THE

MANAGEMENT AND IMPROVEMENT

OF

LIVE STOCK,

COMPILED FROM YOUATT, JOHNSTON, YOUNG, PETERS, STEPHENS, &c.

BY J. W. DAWSON, M. A., F. G. S., &c.
Author of "Acadian Geology," "Handbook of the Geography and Natural History of Nova-Scotia."

SECOND EDITION, REVISED & IMPROVED.

Published under a Grant of the Legislature.

HALIFAX, N. S.:
Printed by Richard Nugent,
AND SOLD BY ALL BOOKSELLERS, AND BY ALL SECRETARIES OF AGRICULTURAL SOCIETIES THROUGHOUT THE PROVINCE.
1856.

To His Excellency Sir J. GASPARD LEMARCHANT, *Knight and Knight Commander of the Orders of St. Ferdinand, &c., Lieutenant Governor, &c.*

MAY IT PLEASE YOUR EXCELLENCY,—

In preparing, by command of your Excellency, a new edition of the "Practical Hints on Live Stock," I have endeavored, by incorporating with it the matter of my previously published pamphlet, entitled "Scientific Contributions toward the Improvement of Agriculture," to produce a connected elementary treatise on our Provincial Husbandry.

In treating a subject so extensive, many omissions must have occurred; and I regret that owing to my departure from the Province before the printing of the work could be commenced, I have been unable to revise the proofs, or to make such corrections and additions as the delay in the printing and the rapid progress of agricultural science had rendered desirable.

Notwithstanding these defects, I trust that the large amount of practical information contained in the work must render it an acceptable and useful addition to the agricultural literature of Nova Scotia. To young persons especially, who may be desirous of obtaining an acquaintance with the principles and most improved practice of Agriculture, it should be exceedingly valuable; and I beg leave to suggest that for their benefit it should be largely introduced into the Schools and School Libraries.

To be able to contribute, even in a small degree, toward the success of your Excellency's enlightened efforts in behalf of the most important industrial pursuit of my native country, will be to me a source of the most heartfelt gratification.

I have the honor to be,

Your Excellency's humble servant,

J. W. DAWSON.

McGill College, Montreal,
June, 1856.

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CHAPTER I.

INTRODUCTORY REMARKS

ON THE AGRICULTURE OF NOVA-SCOTIA, ITS CLIMATE AND SOIL.

Agriculture is more extensively pursued in Nova Scotia than any other branch of industry. With a population of 276,117, the province has 31,604 farmers, while the fishery, the next industrial pursuit in importance, numbers but 9927 men; and a large number of the fishermen, mechanics and lumberers, are also in part farmers. This preponderance of agricultural pursuits, taken in connection with the varied amount of knowledge necessary for the successful prosecution of this important calling, gives to all efforts in the direction of a sound agricultural education for the mass of the people an incalculable importance.

Our agriculture is in a transition state. It may in different districts be found in all stages of advancement, between the first rude attempts of the half-lumberer-half-farmer of a new country, and an approach to the formal and scientific husbandry which is necessary to keep up the productiveness of old land. It is also in a critical state, for if the farmers in our older settlements persist in the wasteful methods of culture which almost inevitably grow up in newly settled regions, they doom their soil to a gradual deterioration, which must ultimately impoverish themselves and their successors. On the other hand, in their endeavours to improve, they are liable to be misled by experiments made and reported without knowledge of the conditions on which their success depended, and by crude hypothesis asserted with as much confidence as if they were the results of careful and methodical inquiry.

Nova Scotians have not been wholly insensible to these evils. In the earlier days of its agriculture, our province could boast of one of the ablest modern writers on the subject; and even now, after all the rapid progress of modern agricultural chemistry, every reader of Young's Letters of Agricola must be astonished at his clear appreciation of facts and principles scarcely thought of, in his day, even by the ablest chemists and agriculturists of Europe. In later times our Boards of Agriculture and their Secretaries and local agricultural societies have laboured in the same great cause; and Agricultural periodicals and modern scientific books have been widely diffused. More recently still, the legislature has recognised agricultural chem-

istry as one of the branches of a higher school education; and the Superintendent of education has endeavored to bring this valuable branch of practical education within the reach of all the children of the province.

Under the enlightened and active patronage of our present Lieutenant Governor, all these agencies for Agricultural improvement are stimulated and extended, and the Provincial and local Exhibitions, the importations of improved stock, the circulation of agricultural information, and the probable connection of an experimental farm with the Normal School now established under the management of a gentleman equally competent and zealous as an educationist and agriculturist, augur an accelerated movement in the progress of our provincial agriculture.

But the question occurs: Will the climate and soil of Nova Scotia repay these efforts? and many persons appear to believe that they will not. We propose, therefore, in the first place to enquire what amount of truth there may be in such melancholy views. It seems evident, that it is scarcely fair to compare our country with those parts of America which present vast tracts of forest, and which are yearly receiving swarms of emigrants, who are cutting down the woods and exporting a great surplus of grain from the first fertility of the virgin soil. Such countries are now yielding large supplies of produce, but their fertility is being rapidly exhausted, and we have no evidence that when the land becomes cleared and the influx of new population ceases, they will be even as productive as the average districts of our province.

Nor is it safe to speak in general terms, either of praise or condemnation, of a country so various in the qualities of its soil as our province. We have some land as bad as any can be; we have in other districts soils not surpassed by any in the world. We have also extensive tracts of soil which require, in order to productiveness, a larger amount of skilful husbandry than they have yet received.

Again, it is not fair to condemn our country because it is subject to bad seasons, and blights and diseases in the crops. As far back in the history of the world as we can reach, we find that the finest climates and soils were occasionally visited with drought and sterility and comparative scarcity, and even famine; and it is so still. So of diseases and blights. The wheat midge, or weevil, has been known in Europe for more than half a century, and probably existed there and in Asia in the days of the first husbandmen; and it desolated the fields of the United States before it visited ours. In like manner the rust, the turnip fly, the potato blight, and a host of other plagues, are well known in other lands, and in some have been more destructive than with us. Such plagues, except in so far as they can be averted or mitigated by skill and forethought, must be accepted as inevitable visitations of Providence, to which every part of the world is liable.

A very good standard of the relative value of lands is their average actual production. Prof. Johnston gives us in his report on New Brunswick, some statistics of this kind, which are very instructive, and we think should convince most farmers, that ours is not a very unproductive country

COMPARATIVE TABLE OF PRODUCE PER ACRE.

	STATE OF NEW YORK. 1845.	STATE OF OHIO. 1848.	CANADA WEST. 1848.	NEW BRUNSWICK. 1849.
Wheat, bus.	14	15¼	12¾	20
Barley	16	24	17½	29
Oats	26	33¾	24¾	34
Rye	9½	16½	11½	20½
Buckwheat	14	20¼	16¾	33¾
Indian corn	25	41¼	24¾	41¼
Potatoes	90	69	84	226
Turnips	88	—	—	460
Hay, tons,	—	1¼	—	1¾

None of the above averages except that for New Brunswick, approaches to what in the agricultural districts of Nova Scotia would be considered a fair crop, and though the methods of farming in Nova Scotia are probably on the whole a little better, than in any of these countries except New York, we may fairly infer that a country which with the confessedly imperfect agriculture of Nova Scotia, can do so well, is by no means a bad farming country.

In further illustration of this point, I quote the following statistics and remarks, for which I am indebted to James Irons, Esq., the Secretary of the Central Board of Agriculture :—

"When due attention is paid to a judicious system of alternating the crops, and bestowing ordinary labor and attention, the following returns per acre are generally realized, viz: Wheat from 25 to 33 bushels; Oats from 35 to 45 bushels; Barley; 39 to 40 bus; Rye, 35 to 45 bus; Buckwheat (gravel variety) 40 to 45 bus; Potatoes (in their days of prosperity) 200 to 300 bus; Turnips, 400 to 600 bus; Mangold Wurtzel, 600 to 800 bus; Carrots and Parsnips, 500 to 700 bus; Hay, (upland) from 25 to 38 cwt.; Do (marsh) from 35 to 50 cwt., often 60 cwt., second year after sowing down. Our grains also excel in weight: the statistics of our Agricultural exhibitions show, that wheat commonly weighs from 60 to 64 lbs. per bushel; Oats from 40 to 48 lbs.; Barley from 50 to 52 lbs. These returns contrast very favorably with those of the Northern States. Our Province in its agricultural capabilities, is, as far as I have been able to judge, superior to any State in America, (not excepting the

'bottom land' in Ohio,) neither are our farmers so much behind their neighbours in skill. Our great deficiency consists in the want of combined action. Every man seems to work with a settled conviction that he was created to labour for himself alone; he drains not, because he thinks the outlay would not be refunded to him; he plants no trees, for fear he might not live to gather the fruit, or shelter his head under the spreading branches; he attempts a little of every thing in the line of farming, without considering whether his farm or its locality are adapted to such systems. The farmer on poor upland districts attempts to fatten cattle when he ought never to aim at any thing beyond raising them for the feeding districts; the moment he commences to feed, he loses.

Just as the marsh farmer becomes minus when he attempts raising young cattle on the fodder which should be appropriated to feeding only,—hence every farmer in the country is losing by a systematic defiance of some natural law, and the consequence is, that the profession is unprofitable, consequently unpopular, and the agricultural standing of our rural population much below what it ought to be. You cannot find a uniform supply of any description of agricultural produce in market, although the country is quite as favorable to a systematic mode of producing, as most parts of Scotland, where the low country farmer buys all his young stock from the highland breeders, at prices which afford a fair profit to both.

I merely mention this, as one instance of our want of success, the fault being our own, though we find it more convenient to blame the soil and the climate."

Further, when we take into account the very low price of agricultural produce in western America and Canada, and the equal or higher price of labor, we should conclude that our produce ought to be able to compete with that of these countries, and that if a farmer can live in Ohio, or New York, or in Upper Canada, he should on the whole be able to live better in Nova Scotia.

Admitting however that the annual produce of the soil in Nova Scotia, will bear comparison with that of the best grain-growing districts in America, our province may still be liable to some special disadvantages from the nature of the climate and especially from the length of the winter.

1. There may be a deficiency of time for farm work. Prof. Johnston on inquiring into this subject in relation to New Brunswick, finds that the average time of latest ploughing is the 17th November, and the average time of earliest sowing, the 21st April. He infers from this, that the average duration of summer, including under this term the working time of spring and autumn, is six months and twenty-two days. He then takes three months and 17 days as the average time required for the growth of spring grain, and calculates that the time for spring and autumn work, before sowing and after

reaping, is three months and three days. These numbers are equally applicable to Nova Scotia, taking the average between the earliest districts in the western counties and the latest parts of the eastern hills. On comparing these dates with those for western New York, Prof. Johnston finds; "1st, that the winter in western New York, is 22 days shorter than that in New Brunswick; 2nd, that this shortness consists in the addition of 21 days to the open weather of fall, and 1 day to the open weather of spring." To counterbalance this advantage, he finds that the New York farmer has a somewhat larger number of rainy days, which reduce his extra time in fall to between 10 and 15 days. These facts would induce us to conclude that the advantage in regard to open weather in New York and Upper Canada as compared with Nova Scotia, does not exceed 20 working days in the year, and this almost altogether in the fall. The farmers in those countries appear to have as much reason to complain of short springs as we have.

There can be no doubt that the period for out-of-door labor in Nova Scotia is much shorter than that in England or Scotland. It must be remembered however, that the number of rainy days in those countries is much greater than with us, and that the action of the frost on the soil here tends to allow the farmer to dispense with the repeated ploughings necessary there.

It appears from the meteorological register of Mr. Poole of the Albion mines, that we have an average number of 114 days of rain and 60 of snow. This is greater than the number for New Brunswick as given by Johnston, but considerably less than that for most parts of Britain. On this subject Prof. Johnston remarks:

"The number of days during which rain impedes the operations of the British farmer is notoriously very great. In some counties, which possess soils of a peculiarly tenacious character, it brings in another evil in addition to that which attends the New Brunswick winter. It not only shortens the period during which the work of preparing the land can be done, but it also makes it heavier or more difficult to do. Thus the farmer's expenses in Great Britain are considerably increased by the precarious nature of the climate he lives in.

"But in New Brunswick the climate is more steady and equable. Rains do not so constantly fall, and when they do descend, the soils in most parts of the Province are so porous as readily to allow them to pass through. Thus the out-door operations of the farmer are less impeded by rain, and the disposable time he possesses, compared with that of the British farmer, is really not to be measured by the number of days at the disposal of each."

2. The winter may exert an injurious influence on grass lands, on stock, and on the employment of labour, which may seriously diminish the Farmer's profits. On the former of these subjects I quote the following remarks from Johnston, reserving some additional views for the chapter on clover and grasses:

"The substance of the evils produced upon grass land, are—That when the winter is changeable, so that a thaw comes on and fills the ground with water, which freezes afterwards, or when the ground, before being covered with snow, is subjected to a severe frost, the grass in old pastures and meadows, and the clover in artificial grass fields, is liable to be thrown out and winter-killed,—that for the same reason winter grain cannot be sown,—that this effect is less on dry and light lands than on such as are wet or heavy, and that early spring rolling very much remedies the evil in grass lands,—that when uncovered, the fine soil is sometimes drifted before the winds in winter,—that the melting of the snows in spring occassionally chills the soils, causes them to run to moss, and sometimes washes them and diminishes their strength.

"The evils complained of here, except the last, which is doubtful, are experienced by New Brunswick, in common with all the northern parts of America. They are only occasional, however, and incidental, and to a certain degree can be prevented.

"The inability to grow winter grain is not infrequent in some parts of Scotland, owing to a similar action of the frost, and the winter-killing of the clover is very generally complained of both in England and Scotland, and many unavailing remedies have been tried to prevent it.

"Only two methods can be depended upon, as likely to be efficacious in lessening the effects of the alternate frosts and thaws.

"These are, *first* a thorough drainage of the land most subject to be winter-killed or chilled in spring, that the water may have a more speedy escape, and thus to a less extent linger and freeze in it. The *other* is the early rolling in spring, recommended by Mr. Farmer of Charlotte county, and practised with so much advantage in the old country. Where land is in good heart, these two methods will often prevent the evils complained of; but for the occasional scorching effects of the cold wind, which, like the north west winds in the neighbourhood of St. Andrew's, sweeps over the ground when naked, and appears actually to burn up the grass, there is one other remedy, in regard to which I may here introduce a few general observations, which apply also to other cases similar to the resent.

"As to the growth of hay, upon which all kinds of stock have hitherto been fed almost exclusively, the practice of mowing the grass land year after year, for ten or twelve or even twenty years in succession, is a sure way of not only exhausting the land, and finally of making it much more expensive to cultivate, but also of making it necessary to devote a much larger portion of the cleared surface to the production of food for the cattle, than under more reasonable management would be required. Let the farmer cease to cut his grass so frequently from the same field without giving them any manure, and he will reap more from each, when he does cut them.

When the grain crop is reaped the land should always be sown down with grass seed, instead of being left, as it so frequently is in some districts, to cover itself with any wild grasses or weeds that choose to spring up; and where the presence of stumps upon new land prevents its being ploughed for two or three years, let it be pastured only till the roots can be taken up, or let it be top-dressed with manure, to some extent, so long as it must be cut for hay. This top-dressing might easily be effected on new land, if the manure which is of necessity made, but which by new settlers is so generally neglected and allowed to run to waste, were carefully collected and spread over the grass land in early spring. The ease with which first crops are raised, by new settlers, from burned land, without any manure, and the practice of clearing and taking the corn crops off a fresh portion every year, has led to this waste of manure, and to the starved crops of hay, which so much of the cleared land now yields.

"This custom of neglecting the hay-lands ought now to be given up by every settler, new and old, and after two years' cutting at the most, except where it is very rank, they ought to be ploughed up and cropped after being manured, or where the stumps still remain and the land cannot be ploughed, it should be top-dressed in the spring when the young grass begins to sprout. Thus larger crops of hay would be universally obtained, and a smaller portion of the cleared surface of the Province be taken up in the feeding of its stock.

"On the farms of New Brunswick, wood is to a certain extent considered a nuisance which it is desirable to get rid of, and hence it has almost every where been cut down indiscriminately, and few attempts have been made to preserve or plant belts or clumps of trees, which in Great Britain are every where found so necessary for the purpose of shelter. The consequence of this is, that almost every cleared section of the country is exposed to certain cold or prevailing winds, which scarcely any where fail every now and then in producing evidently injurious effects upon the farmer's crops.

"Against these winds it is very desirable that shelter should be provided. If belts or clumps of the original forests refuse to withstand the winds to which they have been unaccustomed, when the trees which sheltered them have been cut down, as I understand is very generally the case, then plantations should be made across the course of the prevailing or most injurious winds. It will surprise persons who have no experience as to the effect of such shelter, to see how very much good is produced by it. Not only are the stock kept warm, which feed in pastures so protected, but the herbage and all other crops are remarkably benefitted by it. I know of one formerly unsheltered locality in the north of England, not exposed to the sea breeze, but to the sweep of the wind coming down a wide valley, the grass upon which, for pasture, was raised from 5s. to 40s. an acre of yearly rent, solely by the planting of belts of trees, so as to turn off the prevailing winds."

With respect to the effects of the winter on stock, we have these to contend with in common with all the inhabitants of the northern parts of America and Europe; and though this difficulty must always, to a greater or less degree, be felt, it may and will be greatly alleviated by attention to the following points. 1. More comfortable housing of cattle, which will cause a less consumption of food. 2. The more extended cultivation of turnips and other green crops for winter feeding. 3. Greater attention to the saving of manure and collection of composts for the purpose of promoting the growth of green crops, hay, and straw. It is no exaggeration to say, that with as little attention to these points as they usually receive here, the winter keeping of stock would be nearly as difficult in Scotland or Holland as in Nova Scotia. Johnston's opinions on these subjects are well worthy of attention.

"It is acknowledged at present by chemical physiologists, that warmth is equivalent to a certain portion of food—that an animal which is exposed to more cold will eat more—and that one that is better housed and warmer kept will eat less. To keep an animal comfortable therefore is to save food, and this alone ought to be sufficient inducement, where a scarcity of winter food is complained of.

"In my tour through the Province, I have frequently observed how little attention appeared to be paid to the proper housing of the stock. Wide chinks between the boards or logs, of which the cattle houses or barns are built, or large openings about their feet, too often admit currents of cold air in the winter season. The most of the prevailing winds also find their way through the walls, and the comfort of the cattle is thus continually liable to be disturbed, the chance of their thriving interferred with, and their consumption of food increased. Those who allow such a state of their cattle-houses to continue, unjustly blame the winter for what arises from their own want of care.

"One of the opinions regarding the winter, which I have inserted above makes it a matter of complaint, that much care, attention, and experience are required to keep cattle in condition while the winter lasts; this is no doubt true, but the same qualifications are necessary to success in any other branch of husbandry; and he who is unwilling to bestow all he possesses of them upon the business in which he is engaged, may happen to thrive, yet scarcely deserves to prosper.

"According to some, an acre of land in turnips will go three times as far as the same acre under hay. Crops vary so much, however, that no general rule can be established. It is certain only, that by feeding cattle partly with turnips and partly with hay or other dry food, not only will the same extent of land support more stock, but the same amount of food will go farther than when either of the two is given to cattle singly. Nor is the good conferred upon the farmer by large green crops, confined to the immediate influence upon the

cattle and upon the extent of land necessary to support them; but the manure of a rich quality which they are the means of placing at the Farmer's disposal, enables the same extent of land to produce more corn than before; so that in a double sense he is benefited by this culture—he employs less land than before in feeding his cattle, and he grows more corn per acre on the remainder of his farm."

By these and similar improvements in husbandry, the winter may in fact be shortened, or its evil effects on stock removed. The present difficulties are not so much to be attributed to the climate, as to the attempt to keep stock, without a sufficient culture of green crops to furnish succulent food in winter. The cattle fed on dry food become in winter almost wholly unprofitable, and in spring are turned out half famished, to gain in summer, sufficient strength to endure the privations of another winter. Thus the farmer becomes the slave of his stock, and "the winter eats up the summer."

The difficulty of finding profitable employment for the farmer and his hired men in winter, is often urged against the capabilities of our country, especially for farming on a large scale. That there is some difficulty in this need not be denied. There are, however, many necessary parts of farm work which, with prudent and industrious men, occupy much of the winter. For example, threshing, taking produce to market, collecting manure and materials for composts, as bog-mud, &c.; clearing land, removing stones; cutting and hauling fire-wood and other wood required for fences, buildings, &c., repairing and preparing farm implements and gates, fence posts, frames, &c. If farmers could be induced to attend properly to these and other departments of winter work, and to prepare *in time* for the labours of spring, there would be little cause to complain of the long winter.

Farther, much more time should be spent on manures and stock in winter than is now usually given to them. No time is better for hauling bog, marsh and sea mud, and nothing tells more on the improvement of a farm; the saving and keeping together of barn-yard manure is also a most important department of labor, requiring much attention in winter. The cutting of straw, and steaming and boiling of roots for cattle, regular feeding and attention to their comfort and cleanliness, are also most profitable departments of winter farm work. Flax, hemp, and wool, if cultivated in sufficient quantity, could alone be made to give profitable employment to all the spare time of winter. The winter might also afford time for the prosecution by the farmer of handicraft trades, in the manner so common in Germany and New England; and we must not forget that the winter is precious for the opportunities it affords of mental improvement, and that a severe winter is a good school for a hardy and energetic people.

The above considerations are sufficient to show, that our long winters are blamed for much that is the result of our own ignorance or carelessness, and that it is our wisest course not to condemn our climate

till we have tried earnestly and skilfully to break in the winter to a useful place in our system of farming operations. Above all, every young man should be cautioned against the foolish error, that there is any where a perfect climate, or that there are many not in one way or another subject to drawbacks more injurious than those of ours.

Since writing the above I have seen a very interesting table of Periods of vegetation published by Mr. Poole, in the Eastern Chronicle. It appears from this, that the average time for sowing wheat at the Albion Mines for 5 years is May 10th—the average time of reaping, August 14th: the average number of days the crop is in the ground is 110 In New Brunswick according to Johnston the average time in the ground 100 days; in Scotland according to Stevens, for Spring wheat, 152 to 160. These figures fully bear out the statements made above, and show that the prevalent complaints of our climate have but a slender foundation in fact.

CHAPTER II.

SOILS.

Under this head, after some preliminary statements respecting the mechanical and chemical nature of soils, I shall arrange the soils of the Province in five great classes, and describe each separately.

The mechanical texture of Soils may vary from coarse pebbles or loose sand to the finest and most tenacious clay; and in general, those soils are best adapted for agriculture which consist of mixtures of sand with a moderate quantity of clay and a little vegetable matter. When sand or other coarse matter predominates, the soil is deficient in the power of retaining water and the soluble and volatile parts of manure. When clay is in excess, the soil is too retentive of water, is not easily warmed, does not admit of access of air, and consequently does not allow those chemical changes to take place in the soil and manures placed in it which are necessary to prepare proper food for plants. The following classification of soils in reference to these points is proposed by Professor Johnston:

1. *Pure Clay;* from this no sand can be extracted by washing.
2. *Strong Clay,* Brick clay, contains from 5 to 20 per cent. sand.
3. *Clay Loam* has from 20 to 40 per cent. sand.
4. *Loam* has from 40 to 70 per cent. sand.
5. *Sandy Loam* has from 70 to 90 per cent. sand.
6. *Light Sand* has less than 10 per cent. clay.

Two methods of improving the mechanical texture of the soil are within reach of the farmer.

a. The addition of substances capable of changing the texture. Thus shore sand is sometimes carted upon stiff clays with benefit. In like manner coal ashes, lime rubbish, sandy marl, peat composts, and many other substances ordinarily employed as manures, tend to lighten and pulverize the ground. On the other hand, marsh and creek mud, and similar substances, much improve the texture of light and gravelly soils, by making them more retentive. In applying manures containing much sandy and earthy matter, it is always to the interest of the farmer to consider the effects which they may have on the mechanical qualities of the soil, and to use them on those portions of ground where their effects in this respect will be most beneficial.

b. Draining is by far the most effectual method of improving the mechanical quality of land. Covered drains are those which produce the most beneficial effects, as they draw off moisture from the subsoil without producing wasteful washing of the surface. The effects of underdraining may be summed up as follows:

It makes the soil warmer, by draining off the water which otherwise would keep the ground cold by its evaporation. For this reason it enables the ground to be worked earlier in spring and later in autumn, and renders the growth of crops more rapid.

It tends to prevent the surface from being too much washed by rain, as it enables the water to penetrate the soil, carrying downward the substance of rich manures, instead of washing it to lower levels. It thus saves the riches of the soil from waste.

It allows the roots of plants to penetrate deeply into the soil, instead of being stopped, as they often are, at the depth of a few inches, by a hard subsoil, or by ground saturated with water, or loaded with substances injurious to vegetation. For this reason, drained lands stand drought better than undrained, and their crops are also larger and more healthy. Hence also it often happens, that draining benefits even light lands, if they happen to have an impermeable subsoil.

It permits free access of air, thus preventing the "souring" of the soil, and bringing manures of all kinds into a fit state for absorption by the roots.

It prevents injury to the soil from the water of springs and other waters coming from beneath by capillary attraction. It also prevents baking in dry weather, and causes the ground to crumble more freely when ploughed.

It tends to diminish the effects of frost, in throwing out the roots of clover and grasses.

In short, it renders land easier and more pleasant to work; makes crops more sure and heavy; prevents alike injuries from drought and excessive moisture; economizes manures; and is equivalent to the deepening of the soil, and lengthening of the summer.

The following short summary of the methods of under-draining is taken from "Norton's Elements of Scientific Agriculture." It is to be hoped that its practice will soon be familiar to every farmer in our Province:—

"First, as to their depth; where a fall can be obtained, this should be from 30 to 36 inches. The plants could then send their roots down, and find to this depth a soil free from hurtful substances. The roots of ordinary crops often go down three feet, when there is nothing unwholesome to prevent their descent. The farmer who has a soil available for his crops to such a depth, cannot exhaust it so soon as one where they have to depend on a few inches, or even a foot of surface. Manures, also, cannot easily sink down beyond the reach of plants. On such a soil, too, deep ploughing could be practised, with-

out fear of disturbing the top of the drains. The farmer should not, by making his drains shallow, deprive himself of the power to use the subsoil plough, or other improved implements that may be invented, for the purpose of deepening the soil. There are districts in England, where drains have had to be taken up and relaid deeper, for this very reason. It would have been an actual saving, to have laid them deep enough at the first.

"Second, as to the way in which they should be made, and the materials to be used.

"*a.* The ditch should, of course, be wedge-shaped, for convenience of digging, and should be smooth on the bottom.

"*b.* Where stones are used, the proper width is about six inches at the bottom. Small stones should be selected, or large ones broken to about the size of a hen's egg, and the ditch filled in with these to a depth of nine or ten inches. The earth is apt to fall into the cavities among larger stones, and mice or rats make their burrows there: in either case water finds its way from above, and washes in dirt and mud, soon causing the drain to choke. With small stones, choking from either of these causes cannot take place, if a good turf be laid grass side down above the stones, and the earth then trampled in hard. Cypress or cedar shavings are sometimes used, but are not quite so safe as a good sound turf. The water should find its way into the drain from the sides, and not from the top.

"Stones broken to the size above mentioned are expensive in this country, and in many places they cannot be procured; in England, it is now found that tiles, made of clay and burned, are cheapest. These have been made of various shapes.

"The first used was the horse-shoe tile. This was so named from its shape; it had a sole made as a separate piece to place under it, and form a smooth surface for the water to run over.

"Within a few years this tile has been almost entirely superseded by the pipe tiles (which are merely earthenware pipes, of one inch bore or larger, and made in short lengths). These tiles have a great advantage over the horse-shoe shape, in that they are smaller, and are all in one piece, this makes them cheaper in the first cost, and also more economical in the transportation.

"All these varieties are laid in the bottom of the ditch, it having been previously made quite smooth and straight. They are simply placed end to end, then wedged a little with small stones, if necessary, and the earth packed hard over them. Water will always find its way through the joints. Such pipes, laid at a depth of from 2½ to 3 feet, and at proper distances between the drains, will, in time, dry the stiffest clays. Many farmers have thought that water would not find its way in, but experience will soon show them, that they *cannot keep it out.* The portion of earth next the drain first dries; as it shrinks on drying, little cracks begin to radiate in every direction, and to spread,

until at last they have penetrated through the whole mass of soil that is within the influence of the drain, making it all, after a season or two, light, mellow, and wholesome for plants.

"They form a connected tube, through which water runs with great freedom, even if the fall is very slight. When carefully laid they will discharge water, where the fall is not more than two or three inches per mile. If buried at a good depth, they can scarcely be broken; and if well baked, are not liable to moulder away. There seems no reason, why well made drains of this kind should not last for a century. The pipe tiles are used of from 1 to 1½ inches diameter of bore for the smaller drains, and for the larger, up as high as 4 or 5 inches. They are all made in pieces of from 12 to 14 inches in length. An inch pipe will discharge an immense quantity of water, and is quite sufficient for most situations. These small drains should not ordinarily be carried more than 400 or 500 feet before they pass into a larger one, running across their ends. Where a very great quantity of water is to be discharged, two large-sized horse-shoe tiles are often employed, one inverted against the other.

"Third, as to the direction in which the drains should run. The old fashion was to carry them around the slopes, so as to *cut off* the springs; but it is now found most efficacious to run them *straight down*, at regular distances apart, according to the abundance of water and the nature of the soil. From 20 to 50 feet between them, would probably be the limits for most cases. It is sometimes necessary to make a little cross drain, to carry away the water from some strong spring. In all ordinary cases, the drains running straight down, and discharging into a main cross drain at the foot, are amply sufficient.

"Tile machines are now introduced into this country*, and tiles will soon come into extensive use. Their easy portability, their permanency when laid down, and the perfection of their work, will recommend them for general adoption. It is also to be noticed, that it takes less time to lay them than stones, and that the ditch required for their reception is smaller and narrower. The bottom of it need only be wide enough to receive the tiles. The upper part of the earth is taken out with a common spade, and the lower part with one made quite narrow for the purpose, being only about four inches wide at the point. The bottom is finished clean and smooth, with a peculiar hoe or scoop. This is necessary, because the tiles must be laid on an even smooth foundation."

In connection with draining, *subsoiling* is worthy of a short notice. This may be done either by the subsoil plough, contrived for the purpose, or by running a second plough in the furrow caused by another. In the former case the subsoil is merely stirred and broken; in the latter it is mixed with the soil, which may in some cases have a tem-

* United States.

porarily injurious effect. In either way, a few inches are added to the available depth of the soil, and this may be increased by a second or third subsoiling. Subsoil ploughing is of immense benefit when the surface has been run out by bad farming, and also in soils having a hard "pan" beneath the plough. I have known cases in which the subsoil plough has been the means of producing good crops from cold white sand and clay, previously very unproductive. In very wet and flat land, however, draining should go before or accompany subsoiling, otherwise an injurious wetness may result. Subsoiling is well worthy of the general attention of farmers, and when desirable, several of the smaller farmers might club together in the purchase of a subsoil plough.

Chemical Composition of Soils. It is a remarkable fact, that though soils are merely the debris of the rocks of the earth's surface —mere rubbish, as it were—yet these ingredients are the same *in kind* in all parts of the world; so that the fertile soils of all countries are very similar in their composition. On the other hand, soils differ very much in the *proportion* of their ingredients, according to the nature of the rocks from which they have been derived. Hence, for our present purpose, we may inquire *first*—What ingredients are necessary to all fertile soils? and *secondly*—What are the peculiar excellences and defects, in this respect, of the soils of our Province?

In reference to the necessary ingredients of fertile soils, a large number of analyses have shewn, that they are the following:

1. *Silica*, or the earth of flint, usually in the form of sand, or in finer particles mixed with clay. This substance is especially necessary to form the hard glassy coat on the surface of the straw of the grains and grasses; and in a mechanical point of view, it gives a light, open and porous character to soils. Most soils, with the exception of some peaty and boggy grounds, and very stiff clays, have a sufficient quantity of *silica*. In some soils, however, plants cannot avail themselves of this earth, from a deficiency of other substances necessary to render it soluble.

2. *Alumni*, the pure earth of clay. This is the tenacious and absorbent ingredient of soils, giving them the power of retaining water and the volatile and soluble parts of manures; but when in excess, rendering them stiff and over retentive. *Alumina* is required by plants only in very small quantity, as an element in their structures, and the only soils in which it is deficient are the lightest sands.

3. *Sesquioxide of Iron* (red ochre), gives a red colour to soils, and is of importance, because its presence shows, that they do not contain any of the ingredients usually poisonous to plants, and that they have not been acted on by acids capable of removing the more valuable materials of the soil. It is also believed, like *alumina*, to aid in retaining the more valuable volatile parts of manures; and it

is found in the ashes of most cultivated plants, and must be in some degree necessary to their vigorous growth.

Iron rust (Hydrate of Sesquioxide of Iron) is sometimes an indication of a sour water-saturated soil. In this case, it is the product of the decomposition of the sulphate of iron, or other salts of that metal. The *yellow* iron ochre is therefore, in some cases, an indication of directly the opposite character from that of the *red* ochre. These iron-poisoned soils are in general easily cured by draining and lime.

4. *Carbonate of Lime* (Limestone) is a most important ingredient in soils. Several cultivated plants require large quantities of it, in order to perfect their structure, especially clover and the grasses; and it also performs an important part in the chemical changes by which decaying vegetable matters are rendered useful to growing plants. Hence soils deficient in lime cannot be fertile, and this deficiency is a common cause of barrenness in the poorer districts of this Province.

5. *Gypsum* (Sulphate of Lime), like limestone, is required to form part of the tissues of most plants, and also serves an important purpose in saving ammonia, one of the most volatile and most valuable ingredients of stable manures. Gypsum, like lime, is deficient in many soils otherwise good, and to most soils it may be applied with benefit.

6. *Bone Earth* (Phosphate of Lime) is one of the most important ingredients of soils, though generally present, even in the most fertile, in very small quantity. It is absolutely necessaay in all soils that are required to produce food for man or animals. This substance will be fully considered, under the head of Manures, as it is almost always deficient in the poorer kinds of soil, and is also one of the most costly and difficult to be obtained by the farmer.

7. The *Alkalies* (*Potash and Soda*) are necessary to the growth of all plants, and especially of root crops. They are present in all fertile soils, but in most require to be frequently renewed, as they are rapidly removed by water. The presence of large quantities of these substances in recently burned lands, is one cause of their fertility; and their rapid removal by wasteful farming is an important reason of the running out of such lands. The presence of the alkalies is necessary, in order to enable plants to obtain silica from the soil.

9. Fertile soils also contain a little *Magnesia*, *Common Salt*, and *Oxide of Mangenese*, which appear to conduce to their fertility —though required in much smaller quantity than the substances previously mentioned.

10. Though some plants can grow in soils destitute of organic matter, for instance in pure sand, it is certain, that all the ordinary cultivated plants require, for their healthy growth, a small quantity of animal or vegetable matter in the soil. It was at one time customary

to consider the vegetable or animal matter of the soil as the sole cause of fertility, and in later times, some writers have attached undue importance to the mineral matter of the soil; but it is evident, that in inquiring into the fertility of a soil, we must take both into consideration, in connection with the nature of the plants which the soil is required to produce.

In a fertile soil, the organic matter may vary from 5 to 50 per cent. of the whole. It serves first to supply nourishment rapidly to the crops; secondly, to darken the soil, and thus cause it more readily to absorb the solar heat; and thirdly, to loosen stiff soils and give greater retentive power to very light soils. In some circumstances, a superabundance of vegetable matter is highly injurious. Cases of this will occur farther on.

The above facts show that since plants depend on the soil for supplies of moisture, and of the substances of a mineral nature found in their ashes, as well as for a portion of their purely vegetable part, all fertile soils must necessarily approach to a certain mechanical texture and chemical composition, which shall fit them for producing those plants which we require to cultivate; and though nearly all soils are capable of producing some sort of vegetation, we call those barren whose composition or texture unfits them for our agricultural purposes, —though it sometimes happens that soils naturally barren may be rendered fertile.

We can also readily understand, that since soils are in great part composed of the waste of the rocky materials of the earth's crust, both the mechanical texture and chemical composition must depend in a great degree on the geological structure of the country in which they occur. Hence in a country like ours, whose surface is occupied by several rock formations, very dissimilar in their character, there must be a corresponding variety of soils. Hence also, it is very natural and convenient to arrange these soils in groups corresponding to the distribution of the underlying rocks; and for this reason I shall consider the soils of Nova Scotia under the following heads:—

1. The soils of the Metamorphic district of the Atlantic coast.
2. The soils of the Metamorphic districts of the inland hills.
3. The soils of the Carboniferous and new Red Sandstone districts.
4. The Marine and River Alluvia, or Marsh and Intervale soil.
5. Bog Soils.

Soils of the Metamorphic District of the Atlantic coast.

Lay the edge of a ruler along the map of the Province from the northern part of Clare to the head of Chedabucto Bay, and nearly all the country to the South of this line will belong to the district now to be considered. It is an uneven, but not very elevated country, composed of slates, granite and hard quartzose rocks; full of lakes,

streams and rocky ridges; and contains the greater part of the barren lands of the Province.

Over a great part of this tract, the soils are encumbered with boulders and large stones, though when these are removed, it sometimes happens, that a considerable depth of soil is found beneath. Some of the more stony and rocky tracts are, however, absolutely uncultivable. Of the cultivable soils there are two well marked kinds, which are very prevalent. The first of these is *granitic* soil, derived from the waste of granite and gneiss and some varieties of mica slate. It is generally coarse and sandy, and often in its natural state, covered with black vegetable mould, which is capable for a time of producing good crops. Such soils occur abundantly in the county of Shelburne; between Chester and Halifax; at Musquodoboit Harbour; and between Indian Harbour and Cape Canseau; also in the southern part of Annapolis and King's Counties, in the northern margin of this district. These soils are generally deficient in lime, gypsum, and phosphates, though they often have a good supply of alkaline matter. It is fortunate, that this kind of soil occurs near the sea, since when sea weed and fish offal are applied to it, they afford, in the sea shells and bones contained in them, considerable quantities of lime and phosphates. In improving this soil and keeping up its fertility, lime, lime rubbish, creek and marsh mud, are valuable substances; and when the black peaty mould has been exhausted or burned off, composts of peat and lime will be found very valuable. Fish offal is extremely rich manure, and when applied to these light granite soils, should be composted with swamp mud, and ploughed in with crops, in preference to laying it on the surface. A compost of this kind will be found very excellent for turnips, carrots, or potatos, and if in sufficient quantity, will ensure a good crop of wheat or barley in the ensuing season. An opinion prevails on our Atlantic coast, that wheat cannot be cultivated in consequence of the influence of the fogs. There is some ground to suspect, that the want of success with this crop results, at least in part, from the want of Phosphate of Lime and Ammonia in the soil. Farmers on this coast desirous of improving, should try wheat with good dressings of guano, or fish offal compost, which, in a chemical point of view, is very much the same with guano. These dressings may either be sown with the wheat, or put in with a previous green crop.

The second class of soils in this district, is the *slaty* variety. These are usually clays, more or less stiff, or light and shingly. Where not too much encumbered with fragments of rock, or too shallow, they are generally cultivable, and often of fair quality. Soils of this class occur abundantly in Clare, Yarmouth, northern district of Queen's, Lunenburg, Halifax, and Southern Guysborough. In Yarmouth, Queen's County and Lunenburg, there are large tracts of soil of this kind, of excellent quality, and deserving of being classed with

at least the best second-rate uplands of the Province. In many parts of this district, however, the slaty soils are so intermixed or covered with fragments of quartz rock, flinty slate, &c., derived from the numerous ridges of these hard rocks which traverse the slate formation, as to be much injured, or rendered nearly useless.

When of a retentive nature, these soils should be drained. They also require lime, and their deficiency in this substance would probably have been more manifest than it is, had not the frequent application of sea manure supplied much of this mineral. Gypsum may also be found useful in the lighter varieties of this soil, especially in inland situations,

The slaty rocks often contain sulphuret of iron, which, by the action of the air, is converted into Sulphurate of Iron, a substance which communicates a poisonous quality to the soil, and stains the surface of a rusty colour. Where this is the case, lime will be found highly useful, and gypsum will be unnecessary, since that substance will be formed by the action of the lime on the Sulphate of Iron.

The value of stable manure to these soils has been much underrated. This has arisen in part from the small effects produced by long manure on the stiffer soils. Drainage, liming, and composting the manures, would have given better results. Sea manure, from its speedy decomposition, and the calcareous matter which it contains, suits these soils admirably; though when the stable manures are neglected, it cannot permanently sustain the fertility of the soil.

The two following hints will be found very serviceable in all parts of the Atlantic metamorphic district. *First:* In the lighter granitic and slaty soils, fruit trees thrive well, and might be cultivated in many stony and hilly tracts not serviceable for other purposes. *Secondly:* Stony tracts covered with brushwood, may be converted into excellent pasture, by burning the bushes, liming, and sowing with grass seeds. When treated in this manner, large tracts of the most unpromising parts of our Province will support valuable herds and flocks, which will be supplied with winter food by the cultivation of the wide peat bogs, which abound in these districts. Many facts that I learned in Shelburne, Queen's County, Lunenburg, &c., convince me that our so called barren Atlantic coast must ultimately become an important fruit and wool producing district.

Soils of the Inland Hills (*Silurian and Devonian Systems.*)

Under this head we may notice the soils of the Cobequid range of hills, extending from Cape Chignecto to Earlton; those of the hills on the South side of the valley of Cornwallis and Annapolis; all the hilly country extending from the sources of the Stewiacke through Pictou, Sydney and Northern Guysborough; and the hills of Cape Breton, or at least the greater part of them.

With the exception of some spots too rugged and rocky for cultivation, the soils of this district may be characterized as good. Some of them are formed from the waste of syenite and greenstone, rocks allied to granite, but differing somewhat in chemical composition, and producing much more fertile soils; though these are often very stony. The greater part of the soils of this district, however, are slaty in their character, and consist of brownish loam, with fragments of slate, often giving them a shingly character. They are often deep, and easily worked, and always fertile. They produce in their natural state a fine growth of hardwood timber, and when cultivated are remarkably favorable to the growth of hay and grain crops; though in some localities they are too high for the successful culture of wheat and Indian corn. They are well supplied with lime and phosphates; and when deep are less easily exhausted than most other kinds of upland. Hence in the more fertile parts of these hills, as in Southern Horton, Earlton, New Annan, the Pictou hills, Lochaber, and Northern Cape Breton, there are fine flourishing agricultural settlements, which, in spite of a climate a little more rigorous, are advancing more rapidly in wealth than most of the lower districts.

Farmers who are settled on the deeper and richer soils of this district, may rest assured that they could not secure a more fertile upland soil in any country; and that, with proper economy of their manures, its productiveness may be kept up for an indefinite period. In the poorer and colder soils of this district, and in those which have been run out, draining, subsoil ploughing, and the application of lime, gypsum, and wood-ashes should be resorted to, in connection with the use of all animal and vegetable putrescent manures that can be obtained.

On all the soils of this district, it is probable that gypsum would be found beneficial.

Before leaving this district, I may mention, that the soil of some parts of Clare, Northern Yarmouth, Northern Queen's County, Rawdon, and Douglas, though included in the first district, approaches in its quality to the good soils of the second.

Soils of the Carboniferous and New Red Sandstone Districts.

These occupy the low country of Cumberland, Colchester, Pictou, Hants, King's County, Annapolis, Guysborough, Sydney, and the counties of Cape Breton; and in some places rise on the flanks of the hills. I group together the soils of these two formations, though geologically very distinct, in order to avoid troublesome geographical distinctions. They include, however, a great variety of soils, which may be arranged under the following heads:

1. Loamy and marly soils of the carboniferous system. These usually occur in the vicinity of the large deposits of limestone and

gypsum, which are found in so many parts of our Province. As examples, I may mention the soils of Mabou, Whykokomagh, Long Point, Middle River, Bedeque, Boulardarie Island, (North end), Red Islands, Irish Cove, and other parts of the low land of Cape Breton; Antigonish, South River, Merigomish, parts of East and West Rivers Pictou, River John, Cape John, Tatamagouche, Gulf Shore of Wallace, Wallace River, Pugwash, and various places thence to Minudie; much of the South of Colchester, and North of Hants, especially Stewiacke, Shubenacadie, Newport and Windsor, Gay's River, and parts of Musquodoboit River. In all these localities, and many others, the prevailing soil is a sandy or clay loam, of reddish colours, well supplied with lime, gypsum, and phosphates, and deserving the character of a first class upland: though in some of its more tenacious varieties, more thorough draining than it has yet received is required. Professor Johnston characterizes the lands of this description in New Brunswick, as equal to the best upland of any country.

It is worthy of mention, that this description of soil is often covered with mixtures of hemlock, spruce, and hardwood, though often, also, with fine hardwood forests; and in some districts, forest fires have produced an appearance which causes its value to be much underrated.

Valuable though these soils are, there is often too good reason to perceive, that by the wretchedly exhausting system of cropping too often pursued, they have been reduced to absolute sterility. In such cases, subsoil ploughing would often do much to restore them; and it generally happens that lime, gypsum, marl, swamp and sea mud, are not far distant, and if applied liberally with vegetable manures, would do much to restore fertility.

2. Clays, sands, and stony grounds of the carboniferous district. These are light coloured or reddish stiff clays, white and grey sands, and ground filled with flaggy fragments of hard sandstone, or occasionally with pebbles or other rocks. These varieties of soil are scattered very irregularly over the carboniferous district, depending on the nature of the neighbouring rocks, which may be shales wasting to clay, soft sandstones, or hard flaggy sandstones and conglomerates. All these soils are much inferior to the class last described, though they often occur in its close vicinity, or intermixed with it.

Many of the clays of this class, though stiff and cold, are strong and productive when drained. Lime, coal ashes, peat compost, and sand, or sandy marls, improve them very much, and may often be applied at small expense; attention to drainage is, however, a main point in their cultivation.

The lighter lands of this class are often very poor, and are deficient in almost everything that contributes to the fertility of the soil. Nothing, in short, in the way of manure, will come amiss to them; though the farmer must consider whether it be worth his labour to

attempt their improvement. I have, however, known many patches of such light sandy or gravelly land, by the continued application of mineral and vegetable manures, converted into very productive and very early and sure land.

The stony soils of this class are often very forbidding in their aspect, and sometimes quite useless. In some places, however, I have observed that the stones occur principally at the very surface, and have beneath them good and deep loam. In this case the stones may be built into walls, and leave usually a very sharp and productive soil.

3. Loams, and sands of the new red sandstone. These soils are limited to the country bordering the Bay of Fundy. They occur near Truro, and in a band skirting both sides of Cobequid Bay. They also occur at Salter's Head, Barn-cote, and other places on the northern shore of Hants; and more extensively in the valley of Cornwallis, and thence toward Annapolis. They are generally of a bright red colour, and vary from loams, to sandy loams, and light sands—the latter being sometimes of a whitish colour. The red loams and sands abound in oxide of iron, lime, and gypsum, except when run out. They are, however, often deficient in phosphates and alkalies. Hence, while they are admirable for the culture of the apple, potato, turnip, and Indian corn, they are inferior as grain soils to the best soils of the carboniferous and silurian districts. A notable instance of the lightest sandy lands of this class occurs in Aylesford. Such land requires the same treatment with the light sands, of the last described class. The bog mud of Aylesford, if carted on the sand, would do much toward enriching it; and the bog would be at least equally benefited by a dressing of sand. The lightness, earliness, and great natural draining of soils of this class, in Nova Scotia and Prince Edward Island,—in which latter country they occupy a large area,—make them very desirable to new settlers. It is questionable, however, if—except for the culture of fruit, potatoes, and corn—they are as valuable as much of the heavier land, which is less esteemed. The improvement of agriculture in most countries, adds to the estimation in which heavy lands are held.

4. Soil of the trap district. This is confined to the North Mountain of King's and Annapolis, and its prolongation in Digby, and to a few isolated patches on the opposite side of the Bay. It contains all the chemical elements of fertility, bears a fine natural growth of timber, and yields good crops to the new settler; but is said to fail rapidly under tillage. This must depend either on mechanical defects in relation to absorption of moisture, or on wasteful management on the part of the cultivator. It is at least admirably adapted for pasturage, and its chemical composition shows that it is well fitted for grain crops, if its mechanical disadvantages can be overcome—which is no doubt possible, except where the ground is either very shallow or very stony.

Alluvial Soils.

Of these, we have first, red marsh; secondly, blue marsh, low marsh or corky dyke; and thirdly, intervale.

1. The red marsh, though varying somewhat in quality, is the best soil in our Province, and much of it compares favourably with the most celebrated alluvial soils of the old and new worlds. The following analysis of recently deposited marsh mud from Truro, will serve to shew the composition of this kind of soil.

	Moisture,		.5
	Organic matter,		1.5
Soluble in Water.	Chlorine,	as common salt,	.095
	Soda,		.115
	Potash,		.013
	Sulphuric Acid,	as gypsum,	.073
	Lime,		.061
	Alumina,		.085
	Magnesia,		.094
Soluble in Hydrochloric acid.	Carbonate of Lime		3.60
	Oxide of Iron		2.74
	Alumina		1.20
	Magnesia		.11
	Soda and Potash		.8
	Phosphoric Acid		.09
	Silicious sand (very fine)		87.00

It will be observed that, in the above analysis, all the substances previously mentioned as contained in fertile soils, are present. This marsh mud is not only a valuable soil, but is carted on upland with excellent effect as a manure. When we take this fact in connection with the circumstance that 87 *per cent* of the whole is only silicious sand, and that only one and a half *per cent* of organic matter is present, we can appreciate the vast importance of the substances contained in it.

Such soil requires no foreign appliances to render it fertile. It has however one weak point—its small proportion of phosphates; and I suspect, that if there were not occasionally present in it, fragments of fish bones and other similar organic matters which do not appear in an analysis, this deficiency would appear in a somewhat rapid falling off in its productiveness. It is certain, that the best varieties of this kind of soil will bear continued cropping without manure for a very long period. It is however also certain that it gradually runs out, and the owners of the older marshes already have occasion to inquire for the means of restoring its productiveness.

Draining is well known to be essential to the fertility of the marshes, and there are in this Province many valuable tracts of this land in a comparatively useless condition from its neglect. Admitting the sea

water to deposit new mud, is also a well known remedy in the case of failing, or naturally, poor marsh. It is attended however with the serious disadvantage of causing the loss of several crops.

It seems probable that in the deeper kinds of red marsh, subsoil or trench ploughing might prove very advantageous after the surface has been somewhat run out. There can be no doubt however, that in the heavier kinds of marsh, it would require to be accompanied by very thorough drainage.

It may also be deserving of inquiry if tile drains would be more serviceable than the open ditches in common use. Tiles could be very easily and cheaply made of the marsh mud itself, and when once laid, would require far less attention than ditches; and could be laid in any direction, and in any number, without interfering with the working of the soil.

Lastly, the composition of the marsh mud indicates, that the application of bone-dust would probably be attended with the most marked results, particularly, in increasing the certainty of grain crops, and in producing the more valuable kinds of grasses—Guano would have a similar effect; but a good dressing of bone-dust would be more permanent in its effects. I would recommend to owners of poor or worn out marsh, to try the experiment, and calculate from the increase of crops, whether it would not be remunerative.

2. Blue marsh, sometimes called inner marsh, low marsh, corky dyke, grey marsh. This forms the subsoil of the red marsh, and generally occurs in a belt along the inner margin, next the upland, where the surface is lower than the outer edge, in consequence of the tides depositing the coarser mud near the channels, and finer mud in smaller quantity near the upland. In those parts of the Province where the tides are only of ordinary height, all the marsh that exists is either of this kind, or boggy marsh, composed almost entirely of vegetable matter. The blue marsh usually contains more vegetable matter than the red, and often assumes the character of a boggy swamp. It emits a fetid smell when recently turned up, and the water oozing from it usually stains the ground with a rusty colour. It has the appearance of being a rich soil, but, though it produces, in its natural state, crops of coarse grass when broken up, it is of little value.

Its chemical composition gives the true reason of its comparatively worthless character, and also suggests a remedy. The vegetable matter present in this kind of marsh, acting on the stagnant sea-water, has decomposed the sulphate of soda, of which a small quantity is present in the tide-water, and has set free its sulphur, in the form of sulphuretted hydrogen, which acting on the oxide of iron in the mud, converts it into sulphuret of iron, and changes its colour from red to grey. The sulphuret of iron remains unchanged, while submerged or water-soaked, but when exposed to the air, it passes into sulphate

of iron, or green vitriol; a substance poisonous to most cultivated crops, except the oat, which can put up with a little of it. Hence the bad effects of disturbing the blue marsh—hence also the rusty colour of its water. Land in this state, can be easily tested by drying a small piece of it and making it red hot in the fire; on taking it out, it will be found to emit a strong sulphureous smell, and on cooling, its red colour will be found to be partially restored.

The remedy is draining and liming; and such land will usually stand, without injury, a heavy liming. Draining admits air and takes off the saline water. Lime decomposes the sulphate of iron, and forms sulphate of lime and oxide of iron, both useful substances. The cause and cure of the blue marsh thus involves a series of chemical changes; the last of which may be represented, as follows:

Sulphuric Acid and Oxide of Iron, with Lime } converted into { Sulphuric Acid and Lime, with Oxide of Iron.

When the blue marsh is too low to admit of proper drainage, the only mode of improving it is to dig trenches to the tide channels, and thus admit the muddy tide waters to deposit over it a coat of red mud. Both of these methods have already been employed with success in some parts of this Province.

Though the Blue marsh is by itself so unproductive, yet those varieties of it which contain a good proportion of vegetable matter, when drawn out and composted with lime or marl, form an admirable top-dressing for upland grass.

3. Intervale or fresh water alluvium occurs along most of our rivers, in variable quantity and quality; but is generally a fine and productive soil. It requires the same management with upland soils, and except where it has a loose gravelly subsoil, would often be improved by draining. It is lamentable to see, in the older settlements, so much of this valuable soil almost ruined by an exhaustive system of cropping.

It is worthy of notice that ever since the first cultivation of the alluvial soil of the Euphrates and the Nile, irrigation by running water has been found to be a most efficient means of promoting and restoring the fertility of this kind of land. Many of our intervales are annually overflowed by freshets, and sometimes with very injurious results. But it is a matter deserving of inquiry, whether a regular and systematic admission of the water of the rivers and tributary brooks, might not repay its expense, by its beneficial effects on the crops. Muddy water let in, in this manner, would not only top-dress the soil, but tend to elevate it above the reach of the freshets, and even clear water flowing gently over the surface for a limited time, is known to be highly fertilizing, though the theory of its operation is not well understood.

Some useful facts on this subject will be found in Jackson's treatise on Agriculture and Dairy Husbandry.

Bog Soils.

These are accumulations of vegetable matter in low and undrained places. Some of them are covered with natural grass, and are called meadows, or savannahs; others are clothed with spruces, alders, and other swamp-growing trees; and others with low shrubs and moss. Meadows are valuable in their natural state; though most of them would yield better grass if drained and cultivated. Other bog soils may be rendered productive by clearing and burning the surface vegetation, draining, and coating with sand or soil. When treated in this way, the best of these bog soils are in no respect inferior in productiveness to good marsh land; and are capable of yielding a succession of good crops without any manure. There are very large quantities of this soil now lying unproductive; it may, therefore, be worth while to notice, somewhat in detail, the methods which have been successful in reclaiming it. The following is a sketch of the plan pursued by Mr. J. Taylor, of Pictou, by which he has brought into a good state of culture about twenty acres of this land. His method is essentially the same with that followed by the best reclaimers of bog soils in Scotland.

First, the ground is drained by open ditches, 30 to 36 inches in depth, and much sloped on the sides, to prevent falling in. They are placed at distances apart of 80 to 90 feet, and run into a main trunk drain, carried along the lowest level. The material taken out of the drains is, when rotted or composted, valuable for manuring the upland. *Secondly*, the bushes, stumps, tussocks, &c., are piled and burned; and this is one of the most troublesome and expensive parts of the process,—costing, in some fields cleared by Mr. Taylor, nearly £10 per acre. *Thirdly*, to supply the deficiency of mineral matter in the peaty soil, sand from an adjoining bank is spread over the surface, at the rate of 500 to 1000 loads per acre. The ground is then ready for sowing with oats, wheat, or grass seeds; all of which do well, especially oats and grass, and improve after a few years of cultivation.

The theory of the process, would induce us to conclude that lime might be beneficially applied in reclaiming bog soils; Mr. Taylor, however, has not found it to produce any appreciable good results; though he has now in progress some experiments on the subject, which may be more favourable than previous trials. I have no doubt, that in those parts of the Province where the soil naturally contains little lime, that substance should be applied. It should, however, be used only after draining, and along with a larger quantity of sand or loam.

It is to be hoped, that the large tracts of bog which are found in our Province, will attract the attention of agriculturists, and that their great capabilities will be more generally put to the test.

The above are the principal varieties of soil found in our Province, or at least, occupying large areas. There are a few other kinds, found

in limited spots, and to which it would scarcely be profitable to refer; as the remarks made in reference to the soils more generally occurring, will in great part apply to them. Other facts applicable to the treatment of various kinds of soils, will be mentioned under the head of Manures.

CHAPTER III.

GRAIN CROPS.

Under this head will be noticed the most important of the plants cultivated in our climate, their requirements as to manure and soil, and the blights and diseases to which they are liable.

Wheat.

Spring wheat succeeds well in all our first and second class soils, and with care in those of the third class, except in the highest hilly districts, and in the immediate vicinity of the Atlantic coast, where the fogs and sea winds are supposed to injure it. As already stated however, I am induced to suspect that the failures on the coast are often to be attributed to deficiency of phosphates in the soil, and to defective management, rather than to the climate.

Winter wheat has proved itself very precarious, except in some new clearings, where it is sheltered by surrounding woods.

Of the varieties of spring wheat commonly cultivated, the Black sea and golden straw are at present most in repute. They are early and hardy, but scarcely so productive and nutritious as some of the old varieties of bald white wheat.

Wheat requires to have in the soil a supply of both mineral and organic food in a well elaborated state. Hence it will neither thrive in poor soil, nor in rich soil, containing vegetable matter in a crude or undecomposed state. It also very readily permits weeds or grasses to grow beneath its shelter. For these reasons, newly burned land, land that has been fallowed and manured with composted manure, or land that has been previously cleaned and manured with a green crop, is most suitable for wheat. On lea land it is very subject to rust, and also to the attacks of the Hessian fly, whose larvæ are generally present in the grass, and destroy the wheat which takes its place. The place of wheat in the rotation of a scientific farmer must therefore be that assigned to it in the ordinary Scottish four-course rotation, viz. after a green crop and before grass, which is sowed with the wheat.

The organic part of the grain of wheat consists principally of gluten, albumen, starch, gu[illegible]ugar, oily matter and the woody mat-

ter of the husk. Of these ingredients the most important in reference to human food, are the gluten and albumen, which are also the substances whose elements are least easily obtained from poor soils. They are obtained from the richer kinds of manures; and their nitrogen, the most difficult of their elements to procure, chiefly from the ammonia afforded by these manures. It is also worthy of remark, that the percentage of gluten varies according to the amount of such rich materials in the soil. Hence the wheat of well manured land is not only more abundant, but yields bushel for bushel, more flour—and more nutritious flour, than that of poor land. The rich and well tilled soils of this Province, produce wheat equal to that of any country in the world. The poor and run out lands furnish inferior grain, milling badly, and yielding an inferior flour deficient in gluten.

The ash or earthy part of wheat is also of some importance, especially as for this the plant is entirely dependent on the soil, and though this part of the plant is comparatively small in quantity, yet its due supply is absolutely necessary to its healthy growth.

More than one half of the ash of the straw of wheat consists of silica, an element sufficiently abundant in most soils; but it is to be observed that this element can be obtained only by the aid of potash or soda, which must therefore be present in the soil. Potash and soda are also required independently of the conveyance of silica. The ashes of 1000 lbs of the straw of wheat contain 4½ lbs of potash and soda; the straw contains a much smaller proportion. Wheat also contains in its ash, lime, gypsum, magnesia and common salt, but in small quantity. The ingredient of the ash of wheat, which of all others is the most important, is bone earth or phosphate of lime, of which about 70lbs. are taken by an ordinary crop of wheat from an acre of ground. This may appear to be a small quantity, but it must be borne in mind, that this substance is scarce even in fertile soils. It is chiefly the presence of alkalies and phosphates derived from the ashes of the woods, that causes wheat to produce so abundantly in new land. It is also worthy of notice, that wheat sends its roots deeply into the ground; and therefore prefers a deep soil, or one that has been deepened by subsoiling and under draining.

The facts respecting the composition of wheat stated above, indicate that manures containing nitrogen, phosphates and alkalies, are especially suitable to it. Such manures are guano, urine, animal refuse, ashes, and crushed bones.

Respecting the uses of the grain of wheat, it is unnecessary to say anything. It is not however very generally known, that the straw of wheat, if cut sufficiently early, and chopped with a straw cutter, is highly nutritive food for cattle and horses, and is much relished by them. In this country, wheat is generally cut too late, and thus the grain is thick in the husk and inferior in flouring qualities, and the straw is comparatively worthless. By cutting immediately after the

grain is filled, and before the straw is wholly dead, both would be much more valuable and nutritious.

Wheat, though the most important of the grain crops, has, especially of late, acquired the character of being a precarious crop; and hence much less attention is devoted to it than its importance demands; and persons not unfrequently maintain that Nova Scotia cannot produce a sufficiency of wheaten flour for its own consumption. I have already endeavoured to show, that in its climate and soil there is nothing to prevent the successful culture of wheat. It becomes therefore necessary to inquire into the diseases and blights to which it is liable. I may therefore consider these in detail, remarking in the first place that none of them are peculiar to Nova Scotia, all of them being more or less experienced in most or all the countries in which wheat is cultivated.

1. *Rust or Mildew*—A reddish or rusty substance attached to the straw and leaves of wheat, in the end of summer or in autumn. When examined by the microscope, it is found to be a parasitic fungus or mould, whose minute and invisible seeds are wafted by the winds, or borne into the plant with the water it absorbs from the soil, and taking root in the cells and vessels of the stem and leaf, weaken or kill it by feeding on its juices.

Its attacks are favoured by the following causes. *First*, damp and cold weather succeeding warmth, at the time when the straw is still soft and juicy; hence late grain is very liable to rust. *Secondly*, a deficiency of the outer silicious coat which in the healthy state protects the surface of the straw, or an unnaturally soft and watery state of the plant. These unhealthy conditions may proceed either from poverty and want of alkalies in the soil, from the presence of too much crude vegetable matter, as sod or raw manure, or from a wet and undrained state of the land, which both causes the crop to be late and fills it with watery juices. *Thirdly*, it is probable that when the grain of rusty wheat is sown, or when sound wheat is sown in ground in which wheat has rusted in previous years, the crop may be more easily affected by the disease, because the seeds of the rust fungus may be attached to the seed or may be in the soil.

The best preventives of rust therefore are; *First*, healthy seed; *Secondly*, early sowing; *Thirdly*, draining; *Fourthly*, abstaining from sowing wheat in lea land; *Fifthly*, preparing the soil in such a manner that it shall be sufficiently rich, yet not filled with crude vegetable matter.

2. *Smut or bunt*—This also is a parasitic fungus, which grows *within* the grain, and converts its substance into a dark colored fetid mass of spores or mould balls, which under the microscope look like rough berries, and are filled with the minute dust like seeds of the smut. Its mode of propagation is pretty well understood and easily guarded against. When smutty grain is threshed, the infected seeds

are broken, and the smut being of an adhesive nature attaches itself to the sound grain, and when this is sown, the sporules of the smut pass upward with the sap, and infect the new crop. In like manner, if sound grain be put into bags or boxes which have contained smutty grain, or if it be threshed on a floor on which smutty grain has been lately threshed, it will be infected. These causes of the disease should therefore be avoided by all prudent farmers.

In addition to this however, the seed wheat should always be washed before sowing, that any particle of smut which may happen to be attached to it may be removed. In this way the increase of the evil may be effectually guarded against.

"It is quite certain, that the disease may be at any time propagated by rubbing sound wheat against that which is infected by the fungus. If then the seed be sown in this condition, the result may be easily predicted. The method also of counteracting the evil at once suggests itself. It is merely to cleanse the wheat which is about to be sown, from all the smut which may have attached itself to it, by reason of its adhesive character. The principle of effecting this object clearly must be, to use means to convert the oily matter which causes it to stick obstinately, into a soapy matter which will allow it to be readily washed off. Chemistry here comes to our aid. An alkali will convert oil into soap, and this is the basis of all effectual *dressing* as it is called of seed corn. Almost every district has its peculiar dressing, but the best are merely modifications of this principle. Whatever other ingredients may be used, the effective constituent is some alkaline matter in the form of a ley. Lime, which possesses alkaline properties, has accordingly not unfrequently been resorted to; it must not however be too much slaked in using, or it loses these properties and thus often fails. Common potash and substances containing ammonia, for example, the liquid excrements of animals, have been adopted for remedies. Some persons employ brine, sulphate of copper (blue vitriol), arsenic and other things not possessing alkaline properties. Whenever these methods succeed, it cannot be for the reasons advanced, but it may happen that they destroy the vegetative powers of the seeds of the fungus, though they still remain fixed to the grain.*"

It must be observed, that it is not merely steeping but *washing* that is necessary to cleanse the grain, and the washing process should be aided by some alkaline substance. Solution of potash, ley of wood ashes, and stale urine, are the best washing fluids; and the grain should be stirred in them for some time, and the liquid carefully drained or poured off, after which the grain may be dried by stirring slaked lime, gypsum or dry wood ashes with it. In this Province blue vitriol is very often used, and experience shows that it is generally effectual. It may have some chemical effect on the smut destructive of its vitality.

* "Blights of the wheat"—London.

The same precautions are useful in guarding against the *Dust Brand* or dusty smut. This however is less dreaded by farmers, and there is reason to believe, that its seeds or sporules are more often present in the soil than those of the true smut, as they are scattered about by the winds in autumn.

3. *Ergot.* This is an unnatural enlargement of the grains of wheat, by which they are converted into a black spongy substance about twice the length of the ordinary kernel, and of a very poisonous nature. It is uncertain whether it is merely a diseased growth or a parasitic fungous substance.

Ergot does not usually destroy any large proportion of a crop, but when not attended to, may make it useless or deleterious by its poisonous properties. When observed, the grain should be sifted through sieves sufficiently small to retain the enlarged ergot grains. This should be attended to, whether the grain be intended for the mill or for seed.

It is said that low moist lands are most subject to ergot, and that in such lands the disease may be removed by thorough draining. This view, which seems to be confirmed by experience in this country, deserves the attention of farmers whose fields are infested by this nuisance.

4. *The Wheat Midge or Weevil, Cecidomyia Tritici* of naturalists, has in recent times been the most destructive of all wheat blights. It is improperly called weevil; the weevils, properly so called, being a tribe of beetles the young of which destroy corn in granaries. It is only by a careful study of the habits of a creature of this kind, that we can hope to counteract its ravages. I therefore give here the substance of a paper contributed by me to the Academy of Natural Sciences, Philadelphia, and detailing the results of experiments on the habits and development of the wheat midge.

The observations of naturalists in England, where the creature has been much longer known than in America, have proved that the destroyer is the larva or grub of a minute midge, which deposits its eggs in calm summer evenings, on the chaff scales, whence the little grub when hatched creeps inward to the young grain, on whose juices it feeds. The only point on which any uncertainty remains is the manner in which the animal passes the winter—the prevailing opinion on this subject being that it enters the ground in autumn, though this does not appear to have been confirmed by experiment. To determine this point more precisely I made the following experiments.

I procured a quantity of the larvæ, full grown and in that motionless and torpid state in which they usually appear when the grain is ripe. A portion of these larvæ were placed on the surface of moist soil in a flower pot. In the course of two days, the greater number of them had descended into the ground, previously casting their skins which remained at the surface. I afterwards ascertained that they

had penetrated to the depth of more than an inch, and were of a whitish colour, softer and more active than they had previously been. The fact is thus established, that these apparently torpid larvæ, when they fall from the ripe wheat in autumn, or are carelessly swept out from the threshing floor into the barn yard, at once resume their activity, and bury themselves in the ground.

The larvæ thus buried in the ground, were allowed to remain undisturbed during winter and spring, the flower-pot being occasionally watered. About the end of June they began to reappear above the surface, in the winged form; the little grubs creeping to the surface, and projecting about half their bodies above it, when the skin of the upper part burst and the full grown winged midge came forth and flew off. This completes the round of changes which each generation of these little creatures undergoes, and we have thus actual evidence of each stage of its progress from the egg to the perfect insect.

The perfect midge is a pretty little creature, its body being of a bright yellow colour like that of the larvæ, its two large wings perfectly transparent with iridescent reflections, its eyes black, and its antennæ or feelers long and jointed, the male is smaller than the female, and has its antennæ ornamented with hairs. The flies are most active in calm and warm evenings, when they may sometimes be seen in clouds over the wheat fields. British observers say, that the female deposits her eggs within the chaff; but here, they appear to be generally deposited without.

However we may dread the destructive powers of the midge, we cannot withhold our admiration from the singular instincts with which it has been endowed. The female insect depositing her eggs where food and shelter are provided for the young brood; the larvæ when shaken from their summer abode by the storms of autumn, at once entering on a new and untried life in the soil; and the chrysalids working their way to the surface in the ensuing summer, to assume their winged state in time for the new crop of wheat, display a series of adaptations which may convince us, that, however annoying in the mean time to us, a creature so gifted cannot be without important uses in the economy of Providence.

It is evident, that if no check were opposed to the increase of these creatures, they must ultimately in every country where they occur, consume the whole or nearly the whole of the wheat crop. There are however such checks, some in natural causes, and others in expedients which may be adopted by man.

In Europe the larvæ of a small parasitic insect, *Platygaster Tipulæ*, prey on those of the midge, and no doubt greatly limit their increase. I have not observed this creature in this Province, but probably it may occur here also. In this country, in cold and bare winters, it is probable that many perish; though it is quite an error to suppose that wet weather can kill the larvæ when in the ground.

Moisture in the ground, indeed, appears to be essential to their life. Windy or stormy weather at the season when they are on the wing, must also greatly interrupt them in depositing their eggs. Accordingly they are observed to be most abundant in *sheltered* situations, and elevated and airy places are less liable to suffer from their attacks.

It appears from what has been said above respecting the habits of the midge, that during the greater part of its existence it is beyond the control of the farmer. He cannot prevent it from depositing its eggs, nor can he extract the larvæ from the growing crop; and in the ground in autumn and winter, they are almost equally beyond his reach. *He can however destroy as many of them as he can house with his grain.* In this country, as in Britain, the full grown larvæ remain in the chaff until the grain is ripe, or until they are shaken to the ground by the first violent storms of autumn. When grain is observed to be infected, it should be attentively watched and cut so soon as this can be done without serious loss. In this country, wheat is often left till it is too ripe; over ripe grain being much inferior to that which is earlier cut in the quantity and quality of its flour; and when the weevil is present, there is a double gain in early cutting. It would also be advisable, whenever it is possible, to reap, rather than cradle, the grain, in order to avoid shaking out the insects. The wheat should be threshed on a close barn floor which will not allow the larvæ to fall through, and when the grain is cleaned *all the chaff and dust separated from it should be burned,* or if the chaff be saved for fodder. it should be *kept dry*, and none of it allowed to be mixed with the litter or thrown on the manure heap.

This method costs little trouble, it causes no loss, and if faithfully followed out, would greatly diminish if not altogether prevent the losses occasioned by the weevil. It is worthy of attention, even in cases where the crop is only affected to a small extent. The midge often destroys a fifth, or fourth, or even a third of a crop, without exciting much attention, and it is only when almost total loss ensues that great alarm is excited, but even these partial losses are not of small importance, and by destroying the larvæ in a season in which only a fourth of the crop is lost, we may perhaps prevent a total loss in the next season. It is true, that when this precaution is neglected, Providence, kinder to the farmer than he is to himself, may, by some of the natural causes already mentioned, check the increase of the destroyers; but this will not always occur, and certainly furnishes no excuse for neglecting the means of safety which are placed within our reach.

As an illustration of the saving which can be effected by destroying the larvæ which are housed with the grain, I may mention that the friend who furnished me with specimens for experiment, informed me that from the wheat of eight acres he had obtained about *four bushels* of larvæ of the weevil. After making a large deduction for dust

mixed with them, this quantity must have contained about 150 millions of the insects. If these insects, instead of being burned, had been scattered over the ground, they might if the ensuing season had proved favourable to them, have destroyed the greater part of the wheat crop on the farm.

Various other expedients for the destruction of the midge have been proposed or adopted. When the flies are observed to be on the wing they might be prevented from depositing their eggs by kindling fires on the windward side of the field, or by agitating the grain by stretched lines carried by men or boys, in the calm evenings when the midges are most active. These however are clumsy and troublesome expedients, though, when they can be attended to, they may do much good. It is also probable that if the ground were deeply ploughed, after the larvæ had fallen upon it in autumn, they might be too deeply covered to permit of their escape in the spring. In the ordinary system of rotation however, this could not be done without losing succeeding hay crops; and it is doubtful if it would be very effectual. Perhaps the most effectual remedy ever proposed, is that of discontinuing the culture of wheat for a year, and thus depriving the midges of the necessary food for their larvæ. This is however an expensive expedient, and it requires the consent of all the farmers in the district affected. In the great majority of cases, it might be rendered altogether unnecessary, if the method of destroying the larvæ already described were generally adopted.

The most popular remedy hitherto tried has been late sowing. This however subjects the grain to rust, and necessitates the use of early varieties of grain, which are not usually so heavy or productive as others. It is also probable that in a few years the habits of the creature and the date of its appearance will *change to suit the lateness of the grain* which forms its food, and then the late sowing will prove quite ineffectual. There is some reason to believe that this change is already taking place in some parts of the province where late sowing has been practised. It is also deserving of notice, that bearded varieties suffer less than the bald, as the awns obstruct the insects in depositing their eggs.

The facts above stated may be summed up as follows:

1. The insect deposits its eggs on the grain about the time when it is in flower, and usually in the evening.
2. The larva when hatched attaches itself to the young grain and prevents its growth.
3. When full grown it becomes stiff and torpid, and if left long enough falls to the ground.
4. It buries itself in the ground and thus passes the winter.
5. In July, it emerges from the ground as a perfect insect, in which state, if the weather be favorable, it seeks the growing wheat for the purpose of depositing the germs of a new brood.

Lastly, though there are many partial remedies, the only sure one is to *cut early and destroy all the grubs found after threshing the grain.* To ensure safety, this should be kept up as regularly as the washing of seed wheat to avoid smut.

5. The Hessian fly (*Cecidomyia Destructor*) is a relative of the wheat midge, and at one time threatened like it to destroy the culture of wheat. Its ravages have however in late years materially diminished. It attacks the stems of the young or half grown plants, establishing itself at the base of the shoot or in the joints, and when abundant wholly destroys the crop. The best remedies are careful tillage and preparation of the ground, and abstaining from sowing on lea land, wheat grown on which is especially liable to its ravages. It is probable that several distinct species of insects are popularly known under the name of Hessian Fly.

The total quantity of wheat produced in the Province in 1851 was 297,157 bushels; of which 88,186 or nearly one third was produced in the county of Pictou, an evidence of the extent to which this crop has been neglected in most of the other counties.

The Oat.

The organic part of the kernel of the oat very much resembles that of wheat. Oatmeal contains 10 to 18 per cent of gluten or an analogous substance, and is in no way inferior to wheaten flour as an article of nutriment. In its inorganic ingredients or ash, it differs from wheat in proportion though not in kind; and it requires from the soil a larger amount of inorganic matter in proportion to the weight of the crop. It is therefore a great mistake to suppose, that the oat is less exhausting than wheat, if both straw and grain be removed from the soil. The oat however can take nourishment from raw and undecomposed vegetable matter, such as sod, peat &c., from which wheat can obtain little nutriment.

As in the case of wheat, silica and alkalies are the principal ingredients of the ash. Both are, however, in larger quantity than in wheat. The oat also carries off from the soil a larger proportion of gypsum; hence it thrives in gypseous soils, or in sour soils which contain sulphuric acid, after they have been limed. The quantity of bone earth required by the oat is nearly the same in proportion with that required by wheat.

The above remarks show the proper place of the oat in the rotation, to be that which it usually bears in the ordinary Scottish rotation; viz. the first grain crop after ploughing up the sward. It is well fitted for this not only by its power of extracting nutriment from the decaying sod, but also by its dense shade, which prevents to a great extent the growth of weeds and grasses. The last character, as well as its great demands on the soil for inorganic food, unfit it for sowing with grass seeds, or occupying the place of wheat in the rotation.

It is barbarous farming to extract two successive crops of an exhausting grain like the oat from almost any soil, or to take a crop of oats and then let the land run out into grass. Nothing but dire necessity can excuse these practices, which are unhappily too prevalent. The manure produced from the oat straw, or its equivalent, should in all cases be restored to the soil in the succeeding year for a green crop. If this be done, the soil is improved, rather than deteriorated.

Our country is well adapted to the growth of oats, and this applies even to those parts of it in which wheat is uncertain. Oats must therefore always form a prominent object of attention to our farmers; more especially as we know, that the climate of most parts of the United States is unfavorable to their perfection; and therefore that there must always be a great demand there for any quantity that can be produced here. I hope to see the time when the quantity of oats exported from Nova Scotia will be greater than the quantity of all other grain and flour imported. All that is wanting to ensure this, is energy and skill on the part of the farmer.

Few crops require more frequent changes of seed than the oat. When cultivated for a number of years in the same soil in our climate, it acquires a thick outer husk at the expense of the kernel, and becomes more liable to dust brand. Experience has proved that the best change of seed is that imported from Scotland; and no oats are superior for this country to the early varieties of that country, as the early Angus, Hopeton and Dutch, &c. They are thin-skinned and heavy, and bear cultivation here for 5 or 6 years, before they acquire the appearance and defects of run-out oats. Indeed for two or three years after importation, they greatly improve in size and appearance, though probably not in actual value.

The Black or Tartarian oat is much cultivated in this province, but its only good quality appears to be earliness. It is inferior as a mealing oat both in quantity and quality, and though in some quarters a preference is given to it as food for horses, there can be no doubt that the white is more nutritious. Much loss is also sustained in this country, by the cultivation of those lean, chaffy and bearded oats, that have been run out by long cultivation and mixed by carelessness with better varieties.

The dust brand and the grubs of the Harry-long-legs (*Tipula*) often injure the oat crop, but I am not aware that they have ever become so destructive, as to call for any special attention on the part of the cultivator.

The quantity of oats raised in the province in 1837 was 1,384,437 bushels, or far more than the total quantity of all other grains; Pictou produced more than any other county.

Rye.

This grain is little cultivated in Nova Scotia in comparison with wheat and oats, and its culture is as yet almost entirely confined to the western countries. 61,438 bushels were produced in 1851, of which more than one half grew in the counties of King's County and Annapolis.

The grain of rye does not differ very materially in its composition from that of wheat. It contains however more sugar and less gluten; and the gluten is of a somewhat different nature, at least in its mechanical properties, and is less fitted for the production of a well raised bread. Rye takes less from the soil than wheat. The difference is principally in the straw, which contains less lime, silica and bone earth than that of wheat, but a little more gypsum. The ash of the grain differs very slightly from that of wheat.

Rye prefers light soils, and may be made very useful in bringing in light ground unfit for the growth of wheat. It also forms a substitute for wheat when the latter grain appears to be in danger of being destroyed by weevil; but in ordinary circumstances, it should not be sown on ground capable of producing wheat, being much inferior to that grain as an article of food. It is sometimes sown mixed with wheat, but this is a "*heathenish*" practice, inimical to cleanly and good farming, and now generally abandoned. Rye straw is of little or no value as fodder; but is excellent for thatching, collar-making and basket-making, and makes tolerable hats.

I have been informed that rye has occasionally suffered from the wheat fly, but slightly. Its worst enemy is the ergot, a fungus-like enlargement of the grain, which, like the ergot of wheat, renders it black and poisonous. When the ergot is observed, it should be carefully sifted from the grain before grinding. The principal inducing cause of ergot appears to be too great moisture in the soil; and where this is the case, the culture of rye should not be persisted in, when the ergot is found to appear constantly or often in it.

Barley.

Barley is more largely cultivated in this Province than rye. A larger quantity is produced in Lunenburg than in any other county; there barley is the staple grain crop, and forms a large part of the food of the people. The total quantity produced in Nova Scotia in 1851 was 196,097 bushels.

The grain of barley much resembles in its composition that of wheat, but it contains less gluten and more starch and sugar. It is therefore less nutritious, though in wholesomeness it yields to no other grain. In many parts of the province, barley is little known except for its use as pot-barley, and its value as a material for the manufacture of intoxicating liqours. Its culture as a bread corn,

should, I think, be more widely extended. To most persons the flavor of barley bread is very agreeable, and barley-meal pottage is certainly superior to that of Indian meal or rye flour. Barley is also an excellent substitute for wheat, when the latter is in danger from weevil. It is a very sure crop, and very early; and suits admirably for sowing with grass seeds. Its true place in the rotation is the same with that of wheat. It may however be sown in lea and, though it is not so suitable for this as the oat.

Barley takes rather more from the soil than wheat, and the excess is principally in silica, bone earth, lime, alkalies and gypsum. It is therefore a mistake to suppose, that a good crop of barley does not require a soil in good condition.

Indian Corn.

The culture of maize or Indian corn, is in Nova Scotia somewhat precarious. In 1851 however, which was a very unfavorable year 37,475 bushels were raised, principally in the counties of King's Annapolis and Hants.

The composition of the grain of Indian corn is very variously stated by different chemists. According to Salisbury of New York, quoted by Norton, it contains 60 per cent starch, 10 per cent fatty matter, and 12 to 16 per cent gluten and analogous substances. This would give it a very high value as an article of food, especially for fattening stock. In this climate, Indian corn requires a light, deep soil, and a good supply of rich manure. Gypsum should be strewed on the top of the hills or drills, both as a direct manure, and to prevent the escape of the ammonia from the manure beneath. The most convenient place of corn in the rotation is as a green crop, since the treatment which it requires and its effects on the soil are not very different from those of the turnip and carrot. Good corn may however be raised in lea land and also after green crops in place of wheat, but in both cases manure is required in addition to that already in the soil. It is better to plant corn in drills like turnips, but farther apart, than in hills. Nothing is gained by having the plants crowded; they require much air and light. In stiff soils they should be well earthed up, or the seed may be planted in the tops of the drills, but in light land it should be planted on the level. Frequent hoeing is very beneficial, as also cleaning and earthing with a light plough or cultivator. In the western part of the province pumpkins are often planted with corn; many good farmers however believe, that the gain in pumpkins scarcely repays the loss in corn. This must depend on the degree to which the leaves of the pumpkins deprive the corn of air and light, and on the impediments which the vines offer to the proper culture of the corn.

In some parts of the province it is not generally known that it is useful to cut off the feather or bloom, the male flower of the corn,

after it has served its purpose in fertilizing the ear. This should be done when the beard or tassel of the ear begins to wither but not before, and as few large leaves as possible should be cut off with the top, as all the leaves are useful in aiding the growth of the ear. The tops make good fodder, and when deprived of them the corn is less likely to be broken down by autumnal storms.

Corn is subject to the attacks of grubs which burrow in the stalks, after the manner of the larvæ of the Hessian fly in wheat. The easiest remedy appears to be sowing sufficiently thick to allow spare plants for the grubs. When however time can be spared to pull up and destroy every plant that shows by the fading of the leaf the presence of the grub, the labor will be repaid by the diminished number of grubs in the ensuing season. The seed is also sometimes destroyed by squirrels, birds, &c. This may be prevented by steeping the seed in anything that makes it distasteful to these depredators. Steeping in urine, soft soap or nitre, and drying with lime or gypsum, are said to be serviceable; but smearing with tar has also been practised, and is stated to be more certain.

The meal from corn raised in this province, is finer and more delicate in flavor than that from Southern and Western corn. This should cause it to bring a higher price; and should in connection with the productiveness of the crop, commend its culture to all farmers who have the sandy or loamy soils which it prefers. Even if too late to ripen, it is valuable for fodder, if cut immediately after the frost strikes it.

Buckwheat.

The extended culture of this plant, cannot be considered as an indication of improved or prosperous agriculture; since this grain is generally a substitute for others, or a refuge from the want caused by impoverishment of the ground. Buckwheat, however, is a grain of some value, and, if properly used, need have no connection with bad farming. 170,301 bushels were raised in this Province in 1851,—Cumberland and Colchester producing larger quantities than any other counties.

The kernel of buckwheat contains from 6 to 10 per cent. of gluten, and 50 of starch, with 5 to 8 per cent. sugar and gum (*Norton*). It is, therefore, inferior in nutritive power to all the grains previously noticed; though, still, a very valuable article of food. In Nova Scotia, buckwheat flour, of good quality, is not often seen. A portion of the inner husk is usually ground with the flour; giving a dark color, and bitter taste. When this husk is entirely removed, the flour is pure white, and so dense as to resemble rice flour, or potato farina, and, either in bread or cakes, is a light and agreeable article of food. Of course, the quantity of this fine flour is much less than that of the coarse kind; but the refuse is useful for fattening hogs,

and if a good article were more generally made, its use would be extended and its price enhanced.

Buckwheat does not make large demands on the soil. Its large leaves obtain a great part of their nutriment from the air; and it requires but a small proportion of mineral matter. Hence it can be successfully cultivated on very poor soils, though it certainly thrives better on those that are rich. From the dense shade which it produces, it is an admirable exterminator of weeds; and hence, makes a good preparatory crop for weedy soils or poor grass land. The scattered seeds of the buckwheat itself are, however, apt to be troublesome in the succeeding crop. In England and the continent of Europe, buckwheat is often usefully employed in reclaiming poor soils, by ploughing it in when green. A large amount of vegetable matter is thus given to the soil; and I have no doubt, this would be found useful in bringing in light and worn-out soils in this Province.

The stems and leaves of buckwheat, cut green, make good summer food for cattle; but are less nutritious than clover. Large heaps of buckwheat husks are sometimes seen near mills. They should be composted, and applied to the land; and would be found to be excellent manure.

Beans and Peas.

These plants are remarkable for the large amount of nutriment which their seeds contain, and which is greater even than that of the best wheat or oats. Hence, though they cannot in ordinary circumstances form so large parts of the crop as the cereal grasses, they are important objects of the farmer's attention. 21,638 bushels of peas and beans were raised in this Province in 1851. Pictou and Annapolis produced the largest quantities.

The *French*, or *dwarf kidney beans*, are very valuable as a green crop. Their produce is not very large, but is highly nutritive; and they have the merit of being the best table substitute for the potato. They require compost manure, and to be kept clean from weeds. They may very well occupy a portion of the drills prepared for turnips, as the same manure and mode of culture suits them, and the time of sowing is also the same. French beans should not be in the ground till the buds of fruit trees are bursting, as they are very liable to be nipped by late frosts, or rotted by cold damp weather. The China, white Canterbury, or small white Calavanca, are the best for this climate. The imported calavancas are rather late: but by picking the earliest ripe pods for seed, they soon become sufficiently early. Kidney beans contain 23 per cent. of legumin, a substance analogous to gluten, and 43 per cent. of starch (*Johnston*).

The *horse bean* may be cultivated in the same manner with the French dwarf, but must be sown early. It is used exclusively, at

least in the dry state, for the food of animals, especially horses and hogs. It is more nutritious than the oat, and better for working horses; though at first it is often difficult to induce them to eat it. The small horse or tick bean of England, thrives well in this Province; though most farmers here prefer the early cluster, or some other variety of the broad horse bean, as being more productive, and ripening equally well in this climate. The straw of these beans, if chopped or broken up, is excellent fodder, little inferior in nutritious properties to ordinary hay.

Beans, of all kinds, require from the soil a large quantity of potash and lime, principally for their stems. Manures and composts containing much of these substances are, therefore, especially adapted to them.

The *Pea* approaches very nearly to the bean, in point of nutrition, and perhaps excels it in fattening power; and its straw, or haulm, if saved in good condition, is stated to be little inferior to meadow hay. The straw of the pea contains a large proportion of lime; and hence, this substance, or composts containing it, form very proper top-dressings for a pea crop. The pea occupies a different place in the rotation from the bean; for, though the dwarf varieties may be cultivated in drills as a green crop, it ordinarily thrives very well if sown broadcast in any tolerably rich land, that is not overrun with weeds. Peas have, in fact, no regular place in a rotation, and are somewhat uncertain. They are therefore rather giving way, in the best farming districts, to the culture of beans and turnips. The pea often suffers much from the pea-worm, which is the larva of a small species of moth. No treatment applied to the seed can avert the attacks of this creature, since the egg from which it is produced is deposited by the parent insect in the blossom, or young pod. The best remedy is, to sow very early; and it seems worthy of enquiry, whether early peas, sown in early spring, might not be gathered in sufficient time to permit a crop of buckwheat to be taken from the same ground. At all events, buckwheat might be sown and ploughed in, to enrich the soil.

CHAPTER IV.

GREEN CROPS, ETC.

Turnips, Carrots, Mangel Wurtzel, &c.

These, in most of the countries of the northern temperate zone, form staple green crops; and probably contribute as much to the money returns of the farmer as any other crops. In this country, as yet, their capabilities have been very imperfectly tested; though there can be no doubt that their culture is largely on the increase. The quantity of turnips raised in 1851, was 467,127 bushels; the quantity of other roots, 32,325 bushels. In reference to these crops, Johnston remarks, with much truth, "To raise them, the farmer must prepare, must save, and must husband his manures; he must feed his cattle better, and will thus be led to improve his breeds of stock; while the better harvests of grain he obtains after the green crops, will make these grain crops themselves more profitable, and therefore objects of more useful attention. The spread of green crops in England and Scotland has been invariably the prelude to agricultural improvement, and to an amelioration, not only in the practice but in the circumstances also of the farmers." All these roots contain a large proportion of water; and their nutritive portion is made up of albumen, sugar, gum (pectin), and starch. These substances are present in various proportions, according to the kinds of roots cultivated, the age at which they are taken up, and the nature of the soil and manures. They all require from the soil much potash, soda, lime, bone-earth and gypsum, as well as some vegetable matter; and the manures intended to afford these substances, should, when practicable, be in the form of well rotted composts. Long manure will rarely afford a heavy crop.

The long and severe winters of this province render attention to the cultivation of turnips, and other roots, imperatively necessary to the support and fattening of stock. Without these, except where the farmer possesses tracts of productive marsh, he is a mere slave to his stock, without deriving from it the profit which he ought to receive.

With a proper degree of attention to their cultivation on the other hand, hay is economised—working cattle are more easily kept in good condition—cattle can be fattened in winter, and milch kine can be kept in a productive state throughout the season; at the same time attention to manures is encouraged, and a proper rotation is rendered necessary, by which means the grain and hay crops are also improved. Even in Britain, with its milder winters, we are informed that before the extensive cultivation of the turnip was introduced, "it was impossible to cultivate light soils successfully, or to devise suitable rotations for cropping them with advantage. It was also a difficult task to support live stock through the winter and spring months; and as for feeding and fattening cattle and sheep for market during these inclement seasons, the practice was hardly thought of, unless when a full stock of hay was provided, which only happened in a very few instances. The benefits derived from the turnip husbandry are therefore of great magnitude. Light soils are now cultivated with profit and facility; abundance of food is provided for man and beast, and by the soil being cleaned with this crop, a bed is prepared for grass seeds, wherein they flourish with greater vigor than after any other preparation."

Our best colonial authority on the turnip, is Judge Peters, whose account of its culture is therefore inserted entire in this place:

Culture of the Turnip.

"Buel says:—

'Assuming the average product of hay at a ton to a ton and a half, (which is much more than is generally obtained in this Island,) and of Swede turnips at six hundred bushels per acre, and allowing a bushel and a half of Swedes (90lbs.) to be equivalent for farm stock to 20lbs. of hay, an acre of Swedes will go as far in the economy of feeding as nearly three acres of meadow. The three acres of grass are found to give less than 9,000 lbs. to the dung yard, while the one acre of Swedes gives 36,000lbs., or four times as much as the three acres of grass land.'

"Until our farmers are convinced of this, and shall cultivate turnips as the principal food for wintering their stock and fattening their cattle, we shall find Agricultural improvement advance with tardy steps: we shall continue to see our markets glutted in autumn with beef at two-pence a pound, because, for want of turnips, every one slaughters his beast then, instead of keeping it until it is in good condition; and we shall find the progeny of our fine imported breeds deteriorating in character, instead of maintaining the valuable properties of their ancestors.

"Turnips are generally sown in that part of the rotation which closes one course and commences another; and in this Island it will in general be found convenient to sow them after oats, sown on ley.

On new burnt lands there are few weeds, and excellent crops may be raised with little labour, by merely scattering the seed and hoeing it in; but with this exception, they should always be sown in drills, under which system three acres can be cultivated with less labour than one acre broad cast. The land intended for them should be well and deeply ploughed in autumn, and cross ploughed in the spring, then harrowed and rolled to break the lumps. If the land is foul with couch, have it well cleaned, or the turnip crop will be a failure, or cost more to keep clean than would have cleaned the land before they were sown. Next open the drills: thirty inches apart is the best distance for ordinary culture, as it gives room for the plough and horse hoe to work freely between the drills without injuring the plants. If a prize crop is wanted, perhaps twenty seven inches will give a somewhat larger yield, but they will be more troublesome to clean; and I am convinced that farmers, generally, will find thirty inches between the most convenient distance. When the drills are opened, then cart in your manure, which should be short, and make it in small piles, so that it can be regularly spread in the drills; by making the piles so that they will spread into the three drills in which the horse walks and the cart wheels run, you will spread it more evenly, and with less labor, than from the larger piles, in which I often see it deposited. As soon as the manure is spread in the drills, and before the sun can dry it, split the drills with the plough, which will cover the manure and make a ridgelet over it, then run a light roller length ways along the drills, so as to flatten them on the top, and drill in the seed at once; it is very important that it should be done as soon as the drills are raised, for the grouud is then fresh and damp: whereas, if you leave it, the tops of the drills get dry, and the seed is longer coming up, and the plants grow more slowly. I frequently see persons waiting for days, until the whole of the land is prepared, before they sow. This is a very bad practice, because not only do the drills become dry, but the weeds begin to shoot before the seed is sown; and when the plant comes up, it finds the weeds up before it, and is consequently smothered, and is much more difficult to hoe and clean. The least you can do for the turnip is to give it fair play, and a fair start with its numerous weedy competitors; and, therefore, make it a rule to sow in the evening, or, at furthest, the next morning, every drill that has been dunged and covered during the day.

"Some spread the manure broad cast, and plough it in with the second ploughing, and raise fair crops; but by putting it in the drills, the whole strength of the manure is given to the roots of the turnip, and therefore must promote its early growth more than when spread over a large space of ground. When the manure is ploughed in broad cast, I think it should be done in the fall; a method which seems to produce excellent crops, and saves labor in the spring, when time is of most value to the farmer.

"As to the best time for sowing Swedes, there is much difference of opinion; they may be sown from the 20th May to the end of June; they continue to increase in weight until the frost compels us to pull them, and, therefore, the earlier they are sown, the heavier will be the crop. When sown in May, I have always found them escape the fly; but the best protection against this insect, is thick sowing—never sow less than three pounds of seed to the acre, and you will seldom be without sufficient plants after the fly has done its work. Aberdeen Yellows may be shown from the first to the end of July.

"*Hoeing and Cleaning.*—This is the most important part of turnip culture, for manure as heavily as you please, if this is neglected, or carelessly or imperfectly done, you will not have a good crop; a few days delay, carelessness, or inattention now, will make a difference of hundreds of bushels per acre. There is no crop on your farm which can so ill bear delay at this time as your turnips, and unless you can afford to throw away the labor you have expended, and to forego the benefit of a good supply of turnips for your stock, do this *when it should be done*, and *do it well.* If you are short handed, let every man, woman and child, who can lift a hoe, or pull a weed, go to work in earnest, and the job will soon be accomplished; and, what is more, your children will become expert at turnip culture, on which all successful farming in this Island will, before long, depend: and remember that a good turnip hoer never takes his eye from the ground until called to dinner; recollect this yourself and impress it on the children, and there will be no stopping to talk, nor ceasing work to gaze at every passer by, by which so much time is often lost. The method I have found best in hoeing, is this: as soon as the leaves are between two and three inches long, run a plough between the drills, taking away the earth on each side to within about two inches of the plants, this will make a little ridgelet between each drill, aad cover up all the weeds; and if the horse hoe is run about a week afterwards, they will be found quite rotten and form a good manure for the land; (some use the horse hoe only, but if there is much yar and weeds, the plough makes the best work.) Then set to work with the hand hoes, and thin the plants five inches apart: do not be afraid of stripping the roots of the plants, as the more they are exposed the better; when the plants are a good size, and the leaves begin to touch each other, a second hoeing must be given, cutting out every other plant; this will leave them ten inches asunder, taking away at the same time any weeds that are between them. This second hoeing is very quickly done. If the land is very weedy, the horse hoe should be run between the drills, once before the second hoeing, and once after, and this will complete the work.

"Besides the manure covered in with the plough, small quantities of stimulating manures, placed close to the seed, are of great benefit to the crop; a small quantity of ashes run with the land along the

tops of the drills just before the seed is drilled in, will cause the young plant to grow more quickly, and get sooner beyond danger from the fly: twelve or fifteen bushels is sufficient for an acre, more than twenty is waste. When the manure is ploughed in the autumn, if you have a compost of mud and lime, or mud or ashes, to apply to your turnip land, in addition, the best way of doing it is, after the ground is ploughed in the spring, cart on and spread twenty to twenty-five loads of the compost, then harrow and roll, and then throw the land into ridgelets, with the plough, thirty inches apart; this gathers the greater part of the compost which has been spread into the drills, and within reach of the suckers of the turnip; then roll the drills and sow the seeds. Night soil and bones are excellent help to the crops—the mode of applying them has been already pointed out.

"*Pulling.*—Few directions need be given about this part of the business. The tops and tails should be cut off close to the turnips, or they will not keep so well. Some persons advise the tops to be hauled off and fed to the cattle on other fields. I have tried this, and am convinced it is a very bad practice. In the first place, as food, they are scarcely worth the labour of hauling off; they will keep cattle alive, but if they happen to be fat, they will reduce their condition; and if the milch cows get them, the butter will be unfit for market. But the great objection to removing them is, that it robs the land of what ought to be left to feed the succeeding wheat crop. A heavy crop of turnips is exhausting. In Britain a portion of the turnips is consumed on the land, by sheep. Our climate will not permit this: therefore, as we have to remove the turnips, we should at least leave the tops. If you wish to feed them, and there is time to do so before ploughing, let them be eaten where they grew; or if not, plough them in, and, decaying in the soil, they will enrich the land; whereas removing them is not only a waste of labour, but your wheat crop will reproach you for having done so.

"*Storing.*—Some complain of turnips being difficult to keep; those who find them so, keep them too close: with proper management, there is no difficulty in any quantity. They should be put in piles in the field when first pulled, and covered with tops or straw, and a little earth. Here they will sweat a little. A dry day should be chosen to cart them to the root house. My root house is dug four feet deep, and then the roof pitched from the earth, and covered with sea weed and earth, well sodded over; the floor formed of slabs and longers, raised six inches from the bottom, and divided into three divisions. It will contain about two thousand five hundred bushels of roots, and I generally fill it full, and have never lost any turnips. In the top there is a chimney, which is never shut night or day during the winter; the vacancy below, and the partitions, allow all the confined air to ascend; and as it is constantly escaping through the chimney, no frost comes down. Any one who will ventilate his root house in this

way, will find the turnips as sound in June as when first put in. The situation of the root house is a matter of importance; it should be attached to the barn, and entered from the barn; this will save a deal of labor in carrying them to the cattle during the winter. Some store them in their cellars, which is the worst place that can be selected, as they are generally too hot and close to preserve the turnips, too far from the barn for convenience, and the gas which escapes from them renders the air of the house unwholesome."

The following additional hints on the turnip are condensed from Stephens:—

Varieties of the Turnip.—No fewer than 46 varieties are enumerated, of which, however, only a few deserve the attention of the farmer.

The *Swedish* Turnip takes the first place for weight, value of crop, and capacity for winter storing; and of 18 varieties of the Swede, the *Purple Top* has long obtained the preference. It is of an oblong form, skin under ground and flesh orange yellow, skin above ground dull purple. The skin is rough—the rhind thick, and the flesh hard and crisp. The largest Swedes weigh from 8 to 10 pounds, and the largest are the most rich and nutritive, which is not the case with other turnips. A good crop weighs from 30 to 35 tons per imperial acre.

The *White Globe* Turnip is the best for early maturity, sweetness, and gross weight of crop; but it does not keep so well as the Swede. If of a good variety, its skin will be smooth and white, the neck of the top and tap root small, the leaves long and upright, and it will not emit a hollow sound when struck, as the Tankard turnip, (which is inferior to the White Globe*) does. A good crop of White Globes weighs from 30 to 35 tons per imperial acre. The White Globe is quite equal to the Swede for feeding in autumn and early winter, and should be largely cultivated for that purpose.

The *Aberdeen Yellow* or *Yellow Bullock* Turnip, when of a good variety, is round and wider than deep, with smooth skin, orange yellow below ground, and bright green above; the tap root and crown are small, the leaves soft and spreading, the flesh deep orange, crisp, and not so juicy as that of the Globe. The Aberdeen keeps better than the white, and not so well as the Swede. A good crop weighs from 30 to 32 tons per imperial acre.

The above varieties will be found the most profitable in this country. It must be observed, however, that with culture and manuring, any variety of turnip will be more nutritive in proportion to its weight, than with inferior treatment.

"*Bone dust* is the most important manure for turnips in addition

* This refers to the White Tankard. The Yellow is better. I have been told by a good farmer that the Tankard will thrive on poorer soil, and is less injured by fly than other turnips.

to that produced on the farm. I have tried to raise turnips with different quantities of bone dust, varying from 12 to 24 bushels per acre, and found the crop improved up to 16 bushels, but the quantities beyond that produced no greater effect. As good crops have been raised with 8 bushels of bone dust mixed with a quantity of coal ashes, as with 16 bushels. A better method than using bone dust alone, is to apply it in conjunction with farm-yard dung, say ten or twelve tons of farm-yard dung with eight bushels bone dust. The dung, which should be well rotted, is covered in with the drills, and the bone dust sown afterwards along with the seed."

"The *distance between the rows* of turnips has been fixed, conventionally no doubt, at twenty-seven inches, which is a very convenient distance for drilling up the land in the first place, with the common or double mould board plough, for dunging it with the ordinary tilt cart, and for working the implements employed in turnip culture, such as the sowing drills, and the succeeding scufflers and drill harrows. The distances between the plants should be about twelve inches for Swedes, and nine inches for yellow turnips and globes; and to insure regular and proper distances, the *singling* of the crop with the hoe should be regarded as one of the most important operations which claims your attention. For example, 5 lb. turnips at 9 inches asunder give a crop of 57 tons 12 cwt.: whereas the same weight of turnip at 11 inches apart gives only a little more than forty-seven tons. Now how easy is it for careless people to thin out the plants to eleven instead of nine inches, and yet by so doing no less than 10½ tons of turnips are sacrificed."

The Mangold Wurtzel

Is cultivated in much the same manner with the turnip, but may be thinned to fourteen inches asunder in good ground, and may be transplanted with greater certainty than any variety of turnip, and is much less exposed to the attacks of insects. Its large proportion of sugar and freedom from offensive flavor, adapt it admirably for feeding milch cows, though if fed *exclusively* on these roots their milk is said to fall off. The mangold wurtzel keeps even better than Swedes. I have known them to be kept in a cool cellar until the autumn following that in which they were taken in, and they are said to improve in quality by keeping. Rich clay loams suit the mangold wurtzel better than light sandy soils. It thrives well, however, in drained peat bog. "There are several varieties of mangold wurtzel; the long red, the long yellow, and the globe orange or yellow globe; which names truly indicate their respective characters. The globe orange thrives best on light soils, and the long yellow is in a better state for use in the early part of winter than the long red. The circumstance of beet not being a safe root to give to cattle till it has been some time out of

the ground is the only objection to their indiscriminate use." In Nova Scotia the long red and yellow globe varieties have been somewhat extensively tried, and a new variety, the red globe, has recently been introduced. The former does well only on rich deep soils. The latter will thrive on any soil that is fit to produce good Swedish turnips. The seed of mangold wurtzel resembles that of the beet, of which this plant is a variety. It should be sown by hand, and rather more deeply covered than turnip seed. It may be sown at the same time with Swedish turnip, or earlier if possible. The outer leaves may be stripped off mangold wurtzel in summer for food to cattle; but this injures the roots. No farmer who values the produce of his dairy, will willingly be without mangold wurtzel after having once tried it.

The Carrot.

The culture of this root is usually pursued on a small scale only, but its high nutritive power, its certainty and good keeping properties, as well as the large crop that it yields, make it deserving of more extended culture wherever there are deep and light soils, or they can be deepened by ploughing or subsoiling. The safest and most productive varieties are the long orange and white Belgian. On the culture of the carrot, Judge Peters remarks:—

"Carrots do not require the land to be so rich, but they want it very fine and deep. They seem to succeed best after potatoes; probably because the ground is then light and friable. After the land is cross ploughed, harrowed, and rolled in the spring, it should be thrown into ridgelets, making them as high as you can, so as to give the plant as great a depth of the soil to grow in as possible; eighteen inches is width enough between the drills; but unless the land is very clean, thirty inches will be found the most convenient distance. Roll the drills, and drill the seed, while the earth is fresh and moist, in the same way as turnips. If you sow English seed, you will require four or five pounds to the acre, and then not be sure of a crop; but if American seed* is used, one and a half pounds per acre will be sufficient; as almost every seed grows—at least I have found it so. Eight or ten days before sowing, I mix the seed with fine sand, carefully sifted so that no stones or lumps are left to choke the drill, and keep it moistened with water in a warm room, stirring it up every day. When about to sow, I spread it in the sun for an hour or two, to dry, taking care not to dry it too much, which would injure the seed. I then place a guage, large enough to let a large buckshot through, in my turnip drill (one of Birnie's) and drill the seed in the same manner as turnips. Seed thus treated is generally up in

* Seed produced in the country is probably meant. That from the United States is not usually better than the English; but both are good when recently imported from respectable dealers.

three or four days, and the plants have a fair start with the weeds. They should be sown in May or early in June. In cleaning, use the plough and horse hoe, the same as with turnips. They should be thinned about two and a half inches apart. In August, when the carrots are about the size of a man's thumb, they should be lightly moulded with earth, like potatoes. As to the yield per acre, the smallest I have had is three hundred and thirty-eight bushels; but then, the land being very foul, the drills were three feet apart, to admit of frequent ploughing between them. This last year I had an acre and one-fourth in carrots, on ground which had been in potatoes the year before; it was dressed in the spring with forty loads of dung per acre; the drills were thirty inches apart; the yield on the acre and a quarter was seven hundred thirty-five bushels; they were thinned about one and a half to two inches apart, but the carrots split the drills and made room for themselves, and grew large. Work the soil well, and give it an ordinary dressing, and you will be sure of from four to five hundred bushels per acre. The Long Orange and White Belgian are the most productive. The haulm, or top, of the carrot, is excellent food: cows fed on it give very rich milk: all animals are very fond of it. As they do not appear to be so severe on the land as turnips, the tops may be hauled off and fed on the pasture fields; and an acre of White Belgians, will, in this way, furnish a very large quantity of rich food in autumn. I have tried carrots on land manured with sea weed, and also with river mud; but they would not grow to any size, although turnips in the next drill, on the same manure, grew as well as those on dung. Old well rotted dung and ashes seems the best manure for them. For fattening pigs I have found this root more valuable than turnips, and working horses while fed on them will not require oats."

The Parsnip

Deserves culture on account of its nutritive properties, and because it is the only root that we can leave in the ground during winter, for use in early spring.

"It will grow in a stronger soil than the carrot, and yet may be raised on even peat if sufficient manure be applied. Its culture should be precisely that of the turnip and the carrot, being a green crop and requiring a deep soil for the growth of its fusiform roots. Parsnips should receive twenty-five tons of farm yard manure in the drill, and four hundred of guano sown over the drill, as described in the case of the turnip; and the land then drilled up in the double form or with the setting up double mould-board plough. Parsnips should be singled whenever the plant can be seen, to a distance of eight inches apart in the drill—the stems and leaves spreading more than those of the carrot, require more room. The after-hoeing and cleaning of the land of

weeds with the drill grubber, are conducted in the same manner as those for the turnip and carrot. The drill should be set up with the double mould-board plough, to heap the earth as much about the root as possible, as in the case of the carrot. In a dry season it is well to observe that moistening the seed with wet sand or earth, and stirring it daily, to be sown in the first moist weather, will forward its growth a fortnight. The parsnip should be sown as early as practicable."

In Jersey, parsnips are sown broad cast on old lea land, the sod and about twenty tons of manure being first deeply ploughed in with a trench plough, the plants are weeded, thinned and hoed by hand. In this way the crop yields twenty-seven tons and upwards per acre, or "nearly sufficient for ten cows during the six winter months."*

The Carrot, Parsnip and Mangel Wurtzel suffer little from insects, and are very sure crops; but the turnip has two very troublesome enemies, the turnip flies (two species of *Allica*), and the caterpillar of a moth which attacks the leaves in autumn. Against the ravages of the fly, the following expedients may be adopted. *First*—late sowing, the fly being most destructive in May and the early part of June. *Secondly*,—abundant seeding, which enables the plants to start more vigorously, gives a better chance of selecting strong plants when thinning, and affords food to the fly without losing the crop. The farmer should remember that the fly makes a point of taking its share first, and consequently he must provide for it if he wishes to have any left for himself. *Thirdly*,—sowing while the ground is moist, immediately after the drills are made, and selecting, if possible, the commencement of moist weather. *Fourthly*,—watering the ground when the seed is sprouting, with diluted urine, soap suds, or guano and water, or the drainings of a manure pile. A puncheon with a hole to let the water run out, placed in a cart with a tight bottom, and a narrow slit or a row of notches under the tail-board to spread the water, makes a good watering machine; and in dry weather the benefits in promoting growth and driving off the fly will well repay the cost. *Fifthly*,—sprinkling lime, wood ashes, soot or guano over the young plants, or on the drills when the plants are appearing.

By adopting these methods, or such of them as may be practicable, a crop may always be secured; and if any vacancies occur, they can be sown with white turnips until the beginning of August, or they can be supplied with plants of mangel wurtzel, a bed of which is very useful for this purpose, as they will stand transplanting in any weather. Various dressings for the seed have been recommended, but these do little to protect the leaves, and I have known some of the most offensive of them—as for instance, codfish oil and sulphur—to fail entirely in driving off the insects. It may also be observed for the encouragement of those who wish to extend their turnip culture, that *large fields* usually suffer less than *small patches*, for a very obvious reason.

*Le Couteur.

The worm, or caterpillar, has been found a difficult enemy to deal with, as it sometimes attacks the turnip (chiefly the white and Aberdeen varieties) in immense numbers, and devours them very rapidly. In England, flocks of young ducks turned into the fields have been found to destroy the grubs, and it is likely that watering with soapsuds, ley, lime water, &c., would do something towards diminishing their numbers.

The Potato.

The Potato contains in its tuber a larger proportion of nutriment than the turnip or carrot, and this chiefly in the form of starch or albumen. It requires the presence in the soil of potash and lime in considerable quantity. Much more than one half of the ash of the stem of the potato consists of these substances, and the latter forms more than one-half of the ash of the root or tuber. Potash is contained in the stable manure usually applied to the potato; and in soils containing lime, as those of Cornwallis, and in the vicinity of some of our lime quarries, it thrives well, and is less liable to disease than in others. Some persons suppose that the application of lime and wood ashes cause the potato to be scabbed. This, I believe, is a mistake; but salt and door manure seem to produce this effect. Though the potato will thrive, when otherwise in a healthy state, with raw stable manure in contact with its roots, yet there can be no question that it grows better with rotted manure well mixed through the soil. It is probable that much of the efficacy of sea-weed, which is much used as a manure for potatoes on the coast of this Province, depends on the soda which it contains supplying the place of potash. The sea manure is thus very useful on the slaty soils; and on the granite soils which contain much potash, the lime, afforded by the sea-weed, is probably of more importance than the soda. Animal manures affording nitrogen, are also very important to the vigorous growth of the potato, as to most other cultivated plants.

As in the present state of the potato, the rot or blight is the most important subject of inquiry, I shall insert here an abstract of an article submitted by the writer to the committee of the Legislature of Massachusetts appointed to inquire into this subject, and which was favorably noticed as embracing the conclusions which seemed to be best supported by the facts of the case. In this paper, with respect to the nature of the disease, I remarked—

"1. The general diffusion and simultaneous occurrence of the disease over extensive regions, is a remarkable fact; and the exceptions arising from the differences of soil and other causes, are also very instructive in suggesting remedial measures. Some of these exceptions will be considered subsequently.

"2. The disease has usually attacked the crop at that stage of the growth when the tops are fully formed, and the formation and

filling up of the underground tubers are most rapidly proceeding. Yet early potatoes often pass this critical period in safety, while those which are late are attacked; showing that the weather or temperature acts with or against the predisposition at this particular stage of growth, and modifies its influence.

"3. The disease has usually first made its appearance in the leaves, and descended from these to the stems or roots. In the leaves and stems, it appears in the form of death and decay of the tissues, very similar to that which results from frost, or the application of any poisonous substance. In the tuber, its progress can be distinctly observed, and is somewhat curious. The tuber consists of a vast number of little cells, or bags, filled with a fluid containing vegetable albumen and other substances in solution, and having small grains of starch floating in it. There are usually several of these starch grains in each cell. Through this cellular tissue pass long strings of vessels or tubes communicating with the eyes or buds on the surface of the potato. The disease usually commences at the surface, immediately under the skin, and usually near the eyes, and penetrates inward along the bundles of vessels. From these it spreads to the walls of the cells, and the fluid they contain becomes decomposed and blackened; and after all the rest has been reduced to a brown putrescent mass, the starch grains still remain entire. It has been observed in some instances, that in proceeding from the stem to the roots, the disease appeared first in the tubers nearest to the stem. The best general view that can be given of such a disease is, that it is a mortification of the tissues of the plant, proceeding from something which has diminished its vital energies in such a manner as to allow those changes to go on which ordinarily would take place, only after the death of the plant.

As to causes, two important truths, deducible from the facts already stated, at once meet us.

1st. A disease so general and widely spread, probably primarily depends on some great, and generally operating, predisposing cause. 2ndly. Notwithstanding this, it is locally induced or prevented by the action of a great number of secondary causes, which favor or arrest its developement, and which yet cannot be considered as the primary causes of its appearance. Let us inquire first, into

The inducing or secondary causes of the disease and remedies or palliatives founded on their study.

Most of these causes it will be necessary merely to name, as the greater number of practical men are well acquainted with them. The principal are wet and undrained soils, wet seasons, wet weather after warm, dry weather, when the tops are fully grown; chilly nights succeeding hot days, rank manure in contact with the sets, want of attention to keeping the crop well tilled and free from weeds, run-out seed long cultivated on the same farm. These and similar causes

have evidently had an important influence in locally developing the disease, but *none of them can be its general cause*, since the disease often appears where all are absent, and these causes were quite as general as now, in former times, without producing any such consequence as the potato blight. Some valuable hints, however, as to the best palliatives or temporary remedies for the disease, can be derived from these causes, in connection with the experience of farmers. Of these, the following are very important *temporary remedies or palliatives.*

1. *Early planting*, and planting early sorts; because this gives greater probability of avoiding the effects of autumnal chills and rains. This remedy has been found very effectual in Nova Scotia.

2. *Change of seed*, especially from poor and cold localities, to richer and milder situations. The Scottish low country farmers have obtained excellent results by importing seed potatoes from the bleak and poor highland districts.

3. *Selecting* those *varieties* which have proved *least liable* to the disease; and these will generally be found to be such as have been recently introduced, or lately procured from the seed.

4. *Planting in dry soils*, and underdraining more moist soils, if necessary to plant in them. The dry, sandy uplands of King's County, have almost entirely escaped the disease, when the crop has been put in early.

5. Applying *well-rotted manure*, and plowing it in, instead of putting it with the seed in the drills. *Guano* and composts made with *liquid manure*, have proved themselves better than stable manure. This and the two last remedial agents act by giving the plants a greater degree of healthy, general vigor, than they could derive from run-out seed, in wet soil, or in contact with rank manure.

6. Planting in *new soil* and the use of *mineral manures*. It is generally observed, that the potato has been most healthy when planted in new, virgin soil, before the unskilful agriculturist has extracted from it the stores of alkaline and other mineral manures remaining in it from the ashes of the forest. The composition of the ash of the potato at once explains the reason of this, as the following table, taken from Johnston, will show :—

Ashes in 10,000 lbs. of the roots and stems of the potato.

	ROOTS.	TOPS.
Potash,	40.28	81.9
Soda,	23.34	0.9
Lime,	3.31	129.7
Magnesia,	3.24	17.0
Alumina,	0.50	0.4
Oxide of iron,	0.32	0.2
Silica,	0.84	49.4

Sulphuric acid, - -	5.40	4.2
Phosphoric do. - - -	4.01	19.7
Chlorine, - - -	1.60	5.0
	82.83	308.4

Here we have very large proportions of lime and potash; the latter forming nearly 50 per cent. of the ashes of the roots. Now these substances, potash especially, are plentifully supplied to the soil by the ashes of the wood, and are usually deficient in exhausted lands. Hence, if we apply to run-out, or long cultivated soil, lime, wood-ashes, gypsum, (sulphate of lime), common salt, (chloride of sodium,) bone dust, (phosphate of lime) we supply it with some or all of the more important substances in the above table, and thus assimilate it to the virgin soil in which experience proves the potato to thrive best. I have found, by experience, that healthy potatoes (though not a large crop,) could be obtained by planting with no other manure than a pint of unleached wood ashes in each hill, in seasons when potatoes planted with ordinary manure were blighted.

For the same reasons it is, of course, unwise to raise successive crops of potatoes on the same soil. Whenever, on old land, a proper rotation of crops is not attended to, there is much greater likelihood of failure.

7. Storing in dry cellars is of the first importance, when the crop is infected. I have found that potatoes in which brown spots of disease were already formed, had the progress of the change arrested by being kept dry; and that the diseased spots dried up and lost their putrescent character.

8. Where there is no hope of otherwise saving a crop, the rotting potatoes may be grated or ground up, and the farina or starch saved. With a little extra washing, it will be nearly as good in quality, though usually less in quantity, than that from sound potatoes. Every farmer should have a grater or grating machine for potatoes, and in autumn should prepare a quantity of farina. It is excellent for children's food, puddings, to mix with flour for bread, &c., and it will keep for several years.

All the above, and probably other expedients, have been already approved by experience, as useful palliatives. In short, anything that tends to place the plant in a natural and healthy condition, appears to give it a much greater power of resisting the cause of disease, whatever that may be.*

None of these secondary or partial remedies, however, can be expected to eradicate the disease. They may temporarily prevent it or, when present, mitigate its violence, or diminish the loss resulting

* To this I may add that when the disease is observed in the stalks, the potatoes should be dug at once. If they must be left in the ground, the stalks should be pulled out.

from it. But I shall presently show that we have no reason to suppose that any, or all of them, can effect a perfect cure.

We proceed then, in the next place, to inquire into the

Primary or predisposing cause of the disease, and its remedies.

Almost every fact that can be collected seems to indicate that there must be some general cause of this nature, which began to operate only in modern times; and which has, during the last few years, been almost universally active, but modified by the influences of the secondary causes above referred to.

The ordinary popular resource in seeking for the origin of wide-spread epidemics, is to refer them to the atmosphere. "It is in the air," appears often to be thought a satisfactory explanation. If we ask for proof, none can be obtained either from chemistry or meteorology. If atmospheric, then the cause of the evil is likely at once to be beyond our cognizance and control; besides, we are at a loss, on this hypothesis, to account for the apparently almost entire limitation of the disease to one cultivated plant.

On the contrary, every point in the nature of the disease, and the means hitherto found useful in counteracting it, indicate that the defect is in the plant itself; that from some cause, its vital force has been weakened, so that putrefactive processes lay hold on the substances which, in a healthy state, it could retain unchanged; and that these putrefactive changes can be arrested only when the circumstances are in all respects healthy; while unfavorable circumstances, which in former years produced no effect, are now speedily fatal.

Is there, then, anything in the past history or present condition of the plant, likely to produce such an effect? I have long thought that there is such a cause, and shall now proceed to explain it, in connection with the only means of counteraction which have suggested themselves.

Of all our crops, the potato alone has been continuously propagated by natural or artificial division of the plant. I may remark that the sugar cane, which in the south is cultivated by division of the roots, has, like the potato, run out and become diseased. The tuber of the potato is a sort of underground stem, with eyes or buds intended to produce young shoots in the year following the formation of the tuber, and with a store of starch, albumen, &c., to nourish these young shoots in the early stages of their growth. These tubers, then, in the natural state of the plant, must serve to continue its existence from year to year, and to extend the individual plant into a group or bed of greater or less extent. But this process is not intended to be perpetual. The longest-lived forest tree must eventually die, and so must the group or stool of the potato, which, originally founded by a single seed from a ball, is only one plant increased in extent by a

spontaneous division of its roots into detached tubers. It gradually exhausts the neighboring soil, and its own vital energy diminishes, and at length it will die out; and if a new plant occupy its place, it must be a seedling produced from the balls which have fallen on the spot.

If then, since the potato was introduced into Europe about 250 years ago, we have been continuing its cultivation solely by division or separation of the tubers, we have been perpetuating the life of one individual plant; and we must have now potatos that are the descendants of those imported by Raleigh, not by natural generation through the seed, but by indefinite division of the plant, a sort of infinitesimal fractions by a perpetual division of that now extremely aged individual potato. Have we a right to expect that such plants should be healthy? We may not know the minute changes which bring about the debility of age, but we know that such debility does overtake plants as well as animals. Fine varieties of carnation propagated by cuttings or layers, in a few years degenerate, and must be abandoned by the florist. The same happens to other florists' flowers, though in some more slowly. Grafting and budding fruit trees, is but continuing the lives of individuals, and despite the vigor of the new stock, grafts from very aged trees of old varieties, show the debility of the parent. Hence, most of the finest fruits of a century or two ago, have degenerated and become less worthy of cultivation, and have been replaced by new varieties from the seed. This seems to be one of the great laws of vegetable life, and accordingly, even those plants which, like the potato, have been furnished with tubers to provide for the continuance of individual life, have also been provided with seeds to produce new individuals, and thus permanently continue the species.

Taking this view of the matter, we should rather wonder that the potato has lasted so long, than that it now fails. We can, in truth, account for its long duration, only by taking into consideration the varieties of soils and climates in which it has been cultivated, the frequent changes of seed, and the occasional raising of new varieties from the ball.

If, however, this cause has had any real influence on the plant, why has it not merely run out or died of old age, instead of contracting a malignant and fatal disease. In answer to this, I may remark, that the disease in question is, in fact, merely the death and consequent putrefaction of parts of the tissues of the plant. Further, the analogy of other vegetables leads us to believe that plants do not always simply die out, under the influences of degeneracy or old age. The worn-out carnation loses the size and brilliancy of its flowers; the old varieties of fruit trees lose their vigor of growth, degenerate in their fruit, and become very liable to the attacks of parasitic fungi and animals; the ancient forest, its trees decaying at the heart, and

overgrown externally with lichens, mosses, fungi, and excrescences, usually perishes by tempests or fires, before it undergoes the slow process of natural death. So with the potato. Under high cultivation, its starchy and albuminous parts, those which are valuable for human food, have been increased, while, by constant reproduction from the roots, the vitality of the living buds has been diminishing. The potato, at one time the most certain and hardy of crops, has gradually become tender. The "curl" and "dry rot" began twenty years ago to cut off the young shoots and the planted tubers, apparently because there was not sufficient vegetative life to enable the living bud to control and use the abundant nutriment for it in the cells of the tuber. This difficulty was overcome in part, by changes of seed, planting the whole tubers, and other expedients; and the life of the plant was protracted a little longer, as might have been expected, to be attacked only by some worse disease. And now we have to contend with a mortification of the tissues, not in the infant stage, but in the period of the plant's fullest vigor and strength.

It may be objected, that even renewal from the ball has not been effectual, the seedling varieties having suffered as well as others. It must be observed, however, that seedling varieties have generally resisted the disease longer than others, and that there seems good reason to believe that the disease, like most others that originate, whether in plants or animals, from long exposure to debilitating influences, is more or less contagious. It is quite probable also, that the seed of plants which have already contracted the disease, may be itself not quite free from hereditary taint. Renewal from the seed cannot, therefore, be assumed to have been fairly tried, unless the seedlings have been, at all stages, completely separated from the old varieties, and unless they have been derived from healthy plants, or are separated, by a sufficient number of removes, from their unhealthy progenitors.

I come now to the method which the above views would lead us to consider the only certain one, with a view to the final extirpation of the disease, and it is one requiring the means at the command of the government of a state, or some public body or institution, devoted to agricultural improvement.

It is to cultivate the potato from the ball, for several generations continuously, until the hereditary taint is removed, and then to distribute the healthy tubers to such agriculturists as will pledge themselves to abandon entirely the culture of the present exhausted and diseased varieties.

To succeed in the experiment, it should be conducted on a well managed model farm, or horticultural garden, from which the culture of the old varieties should be entirely excluded, and seed should be obtained from the balls of the most healthy potatos.

The ground should be light and dry, and manured with a mixture of old compost, lime, gypsum, and wood ashes.

The seedlings should be carefully tended and kept very clean from weeds, and any plant, in which the first signs of blight appear, should be at once destroyed.

A part of the seedlings should be carefully covered, and allowed to remain in the ground all winter. The remainder should be carefully packed in dry sand, in a cool cellar, keeping the various sorts separate.

In the second year the same precautions should be used as to the culture of the best varieties obtained in the first year, and some of the plants should have the soil washed away from their roots, and the young tubers picked off, in order to ensure the production of the balls. After picking off the tubers, the plants should be carefully earthed up again.

The seed from the balls of the second year should be sown in the third year, and the whole process repeated, as before The tubers obtained from the first sowing should not be distributed as seed potatos; but those from the second sowing might, if no disease had appeared in the course of the experiments. If disease had appeared, the process should again be repeated. The writer has planted in the present spring (1855) potato tubers, the produce of balls from seedlings themselves the produce of seedlings, and he intends to pursue the process.

The best varieties obtained from the produce of the third or second sowings, should be planted out, to furnish seed tubers, with the same precautions as to manure, &c.

The sound tubers should be given or sold to farmers, who would pledge themselves to cultivate no other varieties, so as to secure them against contagion.

A *national nursery* for new varieties of potatos, on the above plan, should be kept up in every agricultural country, so as continually to supply new and sound varieties. Independently of the prospect of gradually restoring the potato culture, the improvement of the sorts cultivated would amply repay the expense. In the same farm, or garden, experiments might be tried in the culture of wild varieties, obtained from the native country of the potato.

The above suggestions are submitted as probably far superior to any founded on the belief of any one method or substance being effectual as a cure. Such partial remedies, though they may be temporarily successful in particular soils or seasons, never can effect the general or permanent removal of the evil.

Clover and Grasses.

In a country where the winter is long and severe, these must always be important crops; though, as already hinted, when treating of the climate, it is certain that the extended culture of root crops, to

be fed to cattle and horses in winter, would very much lessen the present difficulties in this respect. I have already quoted the opinion of Professor Johnston on this subject, and now give an additional extract on the former and present state of Scotland in this respect:

"The same state of things as now exists in New Brunswick existed in Scotland, in connection with this branch of husbandry, about a hundred years ago. Cattle were killed at the end of summer, and salted for winter use, because the stock of hay at the farmer's command was not sufficient to keep them through the winter months. The beef these cattle gave was so poor that it took the salt badly, was hard and indigestible, and kept badly in the brine. Now, the cattle are not killed in the autumn more than at other seasons. The present modes of husbandry provide winter food for all the stock the farmer finds it convenient to keep. When killed, the beef or mutton are now of excellent quality; large quantities of both are forwarded, all the year through, to the southern markets; and it can be cured for the naval service, or for any other use."

It appears to me that, in the present state of our husbandry, the most important points to be considered, in reference to hay crops, are, in the first place, the injurious practice of cutting hay off the same ground for a great number of years in succession; and secondly, the best modes of promoting and ensuring the growth of clover. To these subjects, therefore, I shall devote the remainder of my remarks under this head.

The skilful farmer should never forget that run-out hay land is in every respect unprofitable. It costs almost as much per acre for fencing, mowing, and raking, as better ground; and yields little, and that little of very inferior quality, possessing little nutritive power. In dry seasons, also, it cannot be depended on. Hence, one acre capable in a good season of yielding three tons, or two tons in a poor season, is far more valuable than 6 or 7 that in a good season may yield, perhaps, one ton per acre, and in a poor season fail altogether. Hay land should be sown out in good heart, and then not more than two crops should be taken, at least without some fertilizing top dressing; and even with top-dressing, not more than three or four. After this, if it cannot be broken up, it should be left for pasture. Circumstances may render necessary partial deviations from this rule; but the principle should be considered as settled, that every deviation will entail loss in the end. Every farmer, on ploughed land, can at least apply this principle to a part of his land—and the larger that part the better. In connection with this, it must be remembered, that good summer pasturage, independent of more direct benefits, does much to aid good winter keeping. Hay culture, without impoverishing the land, is, after all, not so difficult as may be imagined; for the liquid and solid manure of the animals that consume the hay contains nearly

all that the hay took from the soil; and if saved and restored, no impoverishment results. On the other hand, the grand secret of hopelessly and rapidly impoverishing the farm and the farmer, is to crop the land in hay till it will bear no more, and then let the manure go to waste, or sell off the hay. The following anecdote should make some of us ashamed of the manner in which we treat the much abused soil of Nova Scotia: "I visited the farm of a most intelligent gentleman, one of the best farmers in his neighborhood, and, I believe, most desirous to improve; who informed me, that after one dressing with mussel-mud, from the sea bank not far from his farm, he had taken one crop of potatos or turnips, one of wheat, and eight successive crops of hay; and he seemed to think the land had used him ill in not giving him more. For the first four crops, from such an application, a British rent-paying farmer would have been thankful and content; and in taking these, he would have been thought rather hard upon his land, too." (*Johnston.*)

The timothy grass (Herd's grass) usually cultivated in this country, is one of the best of grasses in every respect. It is, however, often treated with injustice, by being allowed to remain too long before cutting. Where there is a large crop to be cut, and few hands, mowing should, if possible, be commenced *before*, rather than after the flowering of the head,—which is the time when the grass contains the largest quantity of nutritive matter. It is true, however, that few grasses will bear late cutting better than herd's grass. Even when left to ripen its seeds, it is worth more as food than many of the light grasses of worn-out lands. The substances which timothy requires to be present in the soil, are very much the same with those needed for grain crops. Its favourite ground is a moist and deep soil.

Clover is a most valuable adjunct to timothy, especially in the lighter soils; but the conditions necessary for its successful culture are as yet very imperfectly known in this country. The ashes of clover contain large quantities of potash, lime and gypsum. These substances must therefore be present in the soil. Clover in fact loves a calcareous soil, and hence it is observable that in those soils which, from the vicinity of beds of lime and gypsum, are naturally rich in calcareous matter, clover thrives without any trouble. I place first, therefore, among the requisites for the successful culture of this crop, the presence of lime and gypsum in the soil. If not naturally present, they must be supplied artificially. The next requisite is a deep and dry soil. Clover sends its roots deeply into the ground, and will not thrive in shallow wet soil. To fit it for clover, such soil should be drained and subsoiled. Thirdly, the leaves of the clover must not be destroyed by the scythe or by cattle, in the autumn of the year in which it is sown. These leaves ought to be employed till the frost kills them, in preparing nourishment for the growth and strengthening

of the root; and if cut arly with the grain, the plant is so enfeebled that it has little chance f standing in winter. In reaping, the wheat straw should be cut so high that the scythe or sickle shall not touch the clover leaves. This high stubble will also shelter the clover in winter. Of course, no cattle or sheep should be allowed to enter the stubble fields in autumn. Fourthly, the ground should be rolled in spring to press in the clover roots. Fifthly, after clover has been sown several times, in the ordinary course of successive rotations, the land becomes "clover-sick," as it is termed, and the crops fall off. In Britain, pasturing for several years has been found to cure this; and manuring with wood ashes, lime composts, and urine, have also been found beneficial.

Neglect of these facts, is the principal cause of the two great evils complained of in this Province in respect to clover, viz: the winter-killing of the roots, and the too early ripening and death of the top in summer. These losses are often attributed to particular varieties of seed; but they depend far more on the nature of the soil, and treatment,—though of course some unfavorable seasons occur in which no management is altogether effectual; and as the natural life of red clover does not extend beyond two or three years, it cannot be expected to remain permanently in the land. Shallow undrained poor soils, which do not allow the roots to become large and strong in the first year; destruction of the leaves of the first year in autumn; deficiency of lime and alkalies; and neglect of rolling,—are the principal causes of winter killing; and the same causes, with the addition, in old farms, of clover sickness, cause the crop to ripen prematurely.

Jackson, in his Agricultural and Dairy Husbandry, states, that clover may be very successfully sown with flax. This fact may be useful to some farmers.

The expense of clover seed tends to prevent the poorer farmers from using it more freely, and hence the land has generally too little seed to give a good crop in first season. There seems no reason to prevent the seed from being more extensively cultivated in this Province. The directions usually given for this are, to allow cattle to eat down the leaves in early spring, or to cut the leaves very early, and then to protect the second growth, and allow it to ripen its seed. The process for cleaning the seed may be seen in many agricultural books. This is a subject deserving the attention of Agricultural Societies, which might usefully give premiums for the best and largest samples.

Flax, Hemp, and Broom Corn.

The culture of *flax* has of late been much recommended; and there can be no doubt that it might be made the means of securing a profitable article of export, as well as of establishing domestic manufactures.

On this subject, I shall content myself with giving a few hints, founded on the composition and habits of the plant. Flax requires very frequent changes of seed. Sowing seed raised in another country, gives a remarkable stimulus to its productiveness. In Britain, American and Dutch seeds are imported and sown, and flax growers always prefer this foreign seed, or that which is but one remove from it, to their own. In this country, where farmers sow seed raised on their farms year after year, short crops must necessarily be the result. Flax prefers well elaborated manure, and must, of course, have clean land. Its proper place in a rotation is, therefore, after a well-tilled green crop. A dressing of lime, or wood ashes, sown with the seed, or after it is up, will be found very advantageous. I have already stated that grass and clover may be sown with flax; and I may add, that the Belgian farmers are of opinion, that the young grass and clover are not injurious, but, on the contrary, beneficial to the flax. Flax has usually been considered an exhausting crop; but the success of clover after it shows that this is not strictly true. The fibre and seed of flax probably take less from the soil than the grain of a wheat crop. The greater part of the inorganic matter taken from the soil is contained in the refuse of the dressing; and if this be composted, or otherwise saved, and restored to the soil, no exhaustion will result. If clover succeed the flax, and be ploughed down after the second crop, its roots will replace most of the organic matter abstracted by the flax.

Hemp is also worthy of the attention of farmers, and is largely cultivated in climates similar to ours. It requires good soil, and is said to clear the ground of weeds. Grain and grasses thrive well after it, which would indicate that it it is not a very exhausting crop. The plants are male and female, the latter of course alone producing seed; but the former, which is smaller and more delicate, producing the best lint. The seed of both sexes must be sown together, and both may be dressed together, but it is advisable to have a separate patch from which most of the male plants have been thinned out, for seed. The crop when ripe, which is known by the disappearance of the farina or bloom of the male plant, and the partial withering of the leaves, is pulled like flax or cut near the ground, and its subsequent treatment resembles that of flax. After being broken on a hand-brake, somewhat stronger and larger than that used for flax, it may be sold to the manufacturers without further preparation. An acre yields from 6 to 10 cwt. of prepared hemp, which is worth about $5 per cwt. The breaking of hemp furnishes a good employment for idle hands in winter. It would probably thrive well on our dyked marshes and intervales, and on the deeper loamy uplands. A very particular account of the mode of preparation, by the Hon. H. Clay, is given in Fessenden's American Farmer.

Broom Corn is recommended by Johnston, to the farmers of New

Brunswick. The early varieties would probably ripen in this Province. The stalks or their upper parts sell profitably for broom-making, a branch of manufacture which might be carried on in this country as well as in the United States. The seeds are said to be equal in value to a crop of oats. It requires rich manure, and cleaning with the hoe; and its general culture resembles that of Indian corn. It is, no doubt, an exhausting crop, as it grows to a great height, and a considerable part of its strong woody stalk is sold off the farm. Full directions for its culture will be found in the American Agricultural books.

Fine specimens of Broom-Corn raised at Bridgetown, Annapolis, and also a broom prepared from the native corn, were shown in the Industrial Exhibition, 1854.

CHAPTER V.

REARING AND MANAGEMENT OF NEAT CATTLE.

The matter under this head is almost entirely selected from Youatt's Grazier*, with some condensation and explanation, where these appeared necessary.

1. *Breeds of Domestic Cattle.*

This being a most important point in the improvement of Stock, the following summary of the characters of the several breeds, as ascertained in England, should form a part of the practical knowledge of every farmer.

The DEVONSHIRE BREED (Figs. 3 & 4) is found in its purest state in North Devon. Its qualities are thus described by Mr. Vancouver, in his Agricultural report on that district.

"Head small, clear and free from flesh about the jaws; deer-like, light and airy in its countenance; neck long and thin; throat free from jowl and dewlap; nose and round its eyes of a dark orange color; ears thin and pointed, tinged on the inside with the same color that is always found to encircle its eyes; horns thin and fine to their roots, of a cream color tipped with black, growing with a regular curve upwards, and rather springing from each other; light in the withers, resting on a shoulder a little retiring and spreading, and so rounded below as to sink all appearance of its pinion in the body of the animal; open bosom, with a deep chest or keel; small and tapering below the knee, fine at and above the joint; and where the arm begins to increase, it becomes suddenly lost in the shoulder; line of the back straight from the withers to the rump, lying completely on a level with the pin or huckles, which lie wide and open; the hind quarters seated high with flesh, leaving a fine hair-ham tapering from the hock to the fetlock; long from rump to huckle, and from the pinion of the shoulder to the end of the nose; thin loose skin covered with hair of a soft or furry nature, inclined to curl whenever the animal is in good condition and in full coat, when it also becomes mottled with

* 9th Edition, London, 1853.

darker shades of its permanent colour, which is a bright red without white or other spots, particularly in the male A white udder is sometimes passed over, but seldom without objection."

This fine looking breed of cattle has, however, some defects in external form, as—

"The sudden retiring of the vamp from behind the huckle to a narrow point backwards; the great space between the huckle and the first rib; a flat-sided appearance, and an awkward cavity between the keel and navel."

"The North Devon Cattle are highly esteemed both for feeding and draught, but are not so much valued for the dairy; yet their milk, though deficient in quantity, is of such excellent quality, that as much butter can be made from that yielded by a North Devon cow, as from that yielded by the breeds which are esteemeed better milkers. For all the purposes of labor, whether for activity, docility, strength or hardiness, this breed cannot be excelled, and the quality of the meat is unrivalled by that of any other breed."

The North Devon breed merits the attention of farmers in this country, whose object is to rear cattle for draught or for fattening.

The SUSSEX BREED—differs from the Devonshire by being larger and coarser. When pure, they are invariably of a dark red colour. They are thus described by an eminent breeder, (Mr. Ellman:) "Head thin; jaws clean; horns long, pointing forward and upward; eye full; throat clear and no dewlap; neck long and thin; shoulders wide and deep; barrel round and straight; space between hip bone and first rib very sma'l."

"The true Sussex Cattle are large hardy animals. They are prized for their labouring powers more than for anything else. Few of the cows are good milkers, nor do the oxen fatten at an early age.

The HEREFORD BREED is a variety of the Devon and Sussex, but is larger and weighter than either. The prevailing colour is reddish brown, and the face white or mottled. The hair fine and inclined to curl, and the skin soft and elastic.

"In the true bred Hereford cattle there is no projecting bone in the point of the shoulder, but it regularly tapers off. They have a considerable breadth before, and are equally weighty in their hind quarters. There is a great distance from the point of the rump to the hip bone; the twist is full, broad and soft; the arm as far as the pastern joint, tapering and full, but thin and tapering below the joint. The animal handles remarkably well, and is especially mellow on the rump, ribs, and hip. The quality of the meat is not hard, but fine as well as fat. There is little coarse flesh about them, the offal and bone being small in proportion to their weight; while their disposition to fatten is equal if not superior to that of any other breed in the island; they are not, however, calculated for the dairy. They arrive early at maturity, and there is a great disproportion in size between the cows and the oxen."

The Herefords are considered to be unrivalled for fatting stock, and might be very profitable on the marsh lands and richer grazing farms of this Province. It is very questionable if they would thrive on our ordinary upland farms.

The SHORT HORNED DURHAM or YORKSHIRE CATTLE (Figs. 5 and 6) are a mixed breed, having several varieties, the best of which is that of the "improved short horns" or proper Durhams. "This breed was introduced about sixty years ago, by Messieurs. Collings, of Darlington, and has rapidly risen in public estimation. They are of good size, beautifully mottled with red spots upon a white ground; their backs are level; the throat clear; the neck fine but not too thin, especially toward the shoulder; the carcass full and round; the quarters long and the hips and rump even and wide. They must not stand too high on their legs; they handle very kindly, are light in their bone in proportion to their size, and have a very fine coat and mellow hide. They possess the valuable property of fattening kindly at an early age; indeed the feeding propensities of the Durhams are unequalled; but they are not good milkers, and are rarely used for agricultural purposes."

"There is a variety of the Durham breed, known as the *Yorkshire polled* cattle. They are without horns, and are in considerable estimation among the London cow-keepers, as being capital milkers, and at the same time maintaining their flesh in a state nearly fit for the shambles." To enable them to do this, however, very high feeding must be necessary.

The Durham Cattle, as well as many crosses of them with other breeds, are now pretty well known in this Province, and much esteemed for fatting cattle, though their deficiency in milk is a great drawback to their general introduction. The following remarks of Prof. Johnston in his Report on New Brunswick, are worthy of attention:—

"For early maturity and a speedy manufacture of beef for the butcher, my own experience has lain chiefly among the short horns, and I am inclined to recommend this breed. At the same time, where the production of human food only is concerned, the *milk-yielding* is much more valuable and productive than the *beef-making* quality. A good cow will give from the same quantity of vegetable food a much larger amount of food for man, in the form of milk, than a fat beast in the form of beef, however early he may arrive at maturity. In respect to this quality the Ayrshire generally exceeds the short horns, so that where milk is wanted, experience is in favor of the former breed. For profitable use among small farmers, therefore, and as a manufacturer of food for his family, the Ayshire is the more sure; for the beef raiser and rich manure maker, the short horn is the more generally useful. It is at the same time true, that some strains of blood in either breed combine both of these qualities or kinds of fitness in the same animal."

Though the Durham short-horns are by no means celebrated as milk-producers, there is an allied *Yorkshire Breed* which produces some of the finest milkers in existence. Milburn thus describes the finest kinds: "The Yorkshire cow is of much larger size than most other milch cows, and when fat will weigh from sixty to eighty stone. Her head is fine and somewhat small; there is a serene placidity of eye which shows a mild and gentle disposition, tending alike to produce fat and milk. The horns are small and white, the muzzle without black spots, the breast deep and prominent, but that and the shoulders thin; the neck somewhat narrow, but full below the shoulders and without loose skin: the barrel somewhat round; the belly capacious, the milk vein large, back perfectly straight, rump wide and flat; tail small, and set on so that there is almost a straight line from the tail to the head. The prevailing colour is roan or red and white, and sometimes white, with the tips of the ears red. The thighs are thin, but the legs are straight and rather short. The udder is very large and muscular, projecting forward, well filled up behind, and so broad as to give the cow the appearance of a waddle in her walking."

Milburn states that these cows have been known to give thirty quarts of milk per day, and as much as fifteen pounds of butter per week. These cows are much valued for the London dairies, and are there fed in such a manner as to produce the largest quantity of milk without regard to quality. Mr. Laycock in his London dairy, which is supplied by Yorkshire cows, retains no cow which does not yield two gallons of milk per day, and the average of his dairy is as much as nine quarts daily." These cows are also said to fatten well, and may therefore be considered as in all points a very profitable breed.

The Long Horned Cattle.—"The finest of these, known as the *Dishley Breed*, have long and fine horns, small heads, clean throats, straight broad backs, wide quarters, and are particularly light in their belly and offal. They give less milk than some other breeds, and are chiefly valuable from their aptitude to fatten early, on the most valuable points, and the superior quality of their flesh. They are hardy and capable of thriving on ordinary pastures, and are said to keep in good condition on less food than other cattle of equal weight. This breed is, however, rapidly giving place to the short-horns, in every part of England."

The Galloway Breed or Polled Scots, (Figs. 7 & 8,) are well known in some parts of this Province, as are cross breeds between them and other varieties. Mr. Mure thus describes the pure breed:—

"Back straight and broad, and nearly level; barrel round; loins broad; hock bones not projecting. In these respects they will compare favorably with any breed. Quarters and ribs long; chest deep but not broad in the twist. The space between the hip bone and the ribs is less than in most other breeds—a consideration of much importance, for the advantage of length of carcase consists in the animal

being well ribbed home, or as little space as possible lost in the flank. Leg short and moderately fine in the shank bones, with a hardiness and disposition to fatten. No breed is so large and muscular above the knee, with room for a deep and capacious chest. The neck is thick almost to a fault."

"The Galloways are a hardy race, subsisting on the coarsest pasture, and increasing rapidly when removed to more favorable situations. They fatten kindly; their flesh is of the first quality; and the joints being of moderate size are more suitable for consumption in private families, than those of the larger breeds." These qualities will fit them for many parts of this Province; but it must be observed that crosses between the Galloway and other breeds have rarely been found advantageous; and hence where this breed is adopted, it is necessary to adhere to it alone. One cross breed, however, that with the Durham bull, has been very advantageous; and the polled SUFFOLK, a variety or cross of the Galloway, is celebrated for its milking qualities.

The HIGHLAND BREED includes two varieties, the *West* and *North* Highlanders. The former are the larger and finer, and are found in great perfection in Argyleshire.

"The horns are large, sharp pointed and up-turned; and the color generally black, though sometimes brindled and dun. The hides are thick, and covered with long soft hair of a close pile. In other respects they are not unlike the Galloway breed, many of whose best qualities they possess, and particularly their hardiness of constitution, beautiful symmetry, and finely flavored flesh. Their straight and level backs, their round and deep carcases, and the quantity of good meat which they yield in proportion to their size, are most valuable points."

The AYRSHIRE BREED, (Figs. 11 & 12) is deservedly celebrated for its milking qualities; and has been found by experience to thrive in this Province, and to form good crosses with other breeds previously in the country. The characters of the pure breed are thus given by Mr. Aiton:—

"Head small, but rather long and narrow at the muzzle; the eye small but quick and lively; the horns small, clear, bent, and the roots distant from each other; neck long and slender, and tapering towards the head, with loose skin below; shoulders thin; fore quarters light and thin; hind quarters large and capacious; back straight; broad behind, and the joints and chine rather loose and open; carcass deep, and the pelvis capacious and wide over the hips, with fleshy buttocks; tails long and small; legs small and short; joints firm; udder capacious, broad and square, stretching forwards and not fleshy, low-hung nor loose; milk veins large and prominent; teats short, pointing outward, and distant from each other; skin thin and loose; hair soft and woolly; head, horns, and other parts of least value, small; and the general figure compact and well proportioned."

The ALDERNEY BREED, (Figs. 1 & 2,) which is peculiar to the Island of that name, and the neighboring Islands of Jersey and Guernsey, is believed to have entered largely into the old stock of this Province; and it has recently been again introduced in a state of purity, by the bounty of His Excellency Sir J. Gaspard LeMarchant. These cattle are thus described by Youatt:—

"The cows are small, but the oxen frequently attain a bulk and stature quite disproportionate to that of the female. Their colour is either light red, dun or cream, mottled with white; the horns are short, gracefully curled, and the bone fine. They are chiefly valued for the dairy, not on account of the quantity of milk which they yield, but the richness of that milk, and the proportionate quantity of butter that can be obtained from it; but they are not good feeders, and seldom make much flesh. The best milch cows are observed to have a yellowish circle round the eye, with the skin at the extremity of the tail of a deep yellow color, approaching to orange."

"Although the breeds throughout the Norman Islands are nearly similar, yet the cattle of Jersey are said to be better than those of Guernsey. They are certainly smaller and more delicate; and so anxious are the inhabitants to preserve them in their native purity, that there is an Act of their Legislature which prohibits the importation of all foreign neat cattle, even from the neighboring Islands, under severe penalties of fine and confiscation, including the destruction of the animal itself, which in such cases is slaughtered and distributed among the poor. When exported, the same Act directs that they shall be accompanied by a certificate of their being natives of the Island; but it is not easy to procure those of best quality. As fattening cattle, the produce of these Islands have few good points; but their flesh is finely grained, highly coloured, and of excellent quality. The cows are rich milkers, and both on that account and because of a certain neatness in their appearance, they command high prices. There is a prevalent notion that they will thrive on any kind of land, and they are consequently kept on bare paddocks, with the assistance of hay in winter. Like all light cattle, they certainly do not require the same support as larger animals, but their native pasture on the Island is of the richest kind; and it is partly owing to the less nutritive herbage, on which they are frequently fed in England, that the quantity of their milk becomes not equal to its quality. In Jersey they are partly fed on parsnips, which are found to improve the quantity and quality of the milk."

Comparative Merits of Breeds.

On this subject I may observe that experience in this Province and the neighboring colonies and states, in so far as I am acquainted with it, indicates; that for fattening stock on marsh or rich upland farms,

the Durham short-horn takes precedence of the other imported breeds. The Herefords have also been tried, but not with the same success. The Devon has, in this country as in England, proved excellent for draught, but inferior to the Durham for early fattening. For dairy purposes the Ayrshire and Alderney must take the highest place.

The Galloway and Highland cattle are not now to be found here in a state of purity, and there can be little doubt that the introduction of good specimens of these cattle, as fattening stock for upland farms, would be very useful. As dairy cattle, the Yorkshire variety of the short-horns, and the Suffolk polled, appear to deserve a trial.

Many individuals of the mixed breeds which prevail in this Province, and have long been naturalized in it, are of excellent quality; and by attention to the points and treatment mentioned under subsequent heads, and by judicious crossing with the imported breeds, herds may be secured equal to those of any country, and well adapted to our climate. Our native cattle have suffered much from want of care in selecting the best animals to breed from, insufficient food when young, and bad winter keep; but many of them still possess some of the most important characters of good animals, and will show them under good treatment; while on the other hand, with careless management, the best foreign breeds will become unprofitable and degenerate.

The following facts relating to the comparative weights and produce of different breeds in Great Britain, are given as data for comparison with the results obtained in this Province.

Fattening Properties.

"The Durham Ox (of the short-horned breed), a son of Charles Colling's Favorite, weighed 187 stone 2 lbs. The Yorkshire Ox, bred by Mr. Dunhill of Newton, near Doncaster, weighed when killed 264 stone 13 lbs. These are weights of 14lbs. to the stone, and shew the capabilities to accumulate fat and flesh possessed by this extraordinary race of animals." (Milburn.)

"At about three years old, the Durham short-horns often weigh from 80 to 100 stones. The celebrated "Durham Ox" of Mr. Colling (already mentioned), weighed, when alive, at ten years old, 270 stones; and after a two months illness, occasioned by dislocation of his hip-bone, he weighed as follows:—

	Stone.	Lbs.
Four quarters - - - -	165	12
Tallow - - - -	11	12
Hide - - - - -	10	2
	187	12

(*Youatt.*)

"The relative estimation of the flesh of the principal breeds at Smithfield market, and the average differences of price for the best qualities of each in January, 1853, were as follows :—

Scotch Oxen,	4s. 8d.	per stone of 8lbs to sink the offal.
Leicester, Hereford, and fine short horns,	4s. 6d. to 5s.	do.
Coarse inferior beasts,	3s. 6d.	do. do.—(*Youatt.*)

"A bullock of the *Galloway* breed, well fattened, will weigh from 40 to 60 stones at 3 to 3½ years of age; and some have been fed to more than 100 stones imperial weight, at five years old."—(*Youatt.*)

"The *West Highlanders* will weigh, with amazingly little care, from 48 to 50 stones; and some have been said to reach as high as 70. The "Doddies" or polled cattle of Aberdeenshire, will weigh from 70 to 80 stones; and will even reach as far as 100 stones when five or six years of age. The tendency of the flesh in all the hardy Scottish cattle is to form on the back."—(*Milburn.*)

"The Suffolk polled cattle, though as already stated, good milkers, fatten with rapidity. The cow is easily fattened to forty or five and forty stones (500 to 600 lbs.), and the quality of her meat is excellent. These Suffolk cattle are believed to have sprung from the Galloway."—(*Youatt.*)

The following are experiments made between Devons and West Highlanders and Galloways :—

"Twenty Devons and twenty Scots were bought in October, 1822, and wintered."

"Ten of each sort were fed in a warm straw-yard upon straw alone, but with liberty to run out upon the moor."

"Ten were fed in a meadow, having hay twice every day until Christmas."

"They afterwards lay in the farm yard, and had oat straw and hay, cut together into chaff. They were then grazed in different fields, equal proportions of each sort being put in the same field."

"Those that lay in the warm straw-yard with straw only, were ready as soon as the others, although the others had an allowance of hay during the winter."

"Sixteen of each were sold at different times; March 24th, 1824, being the best sale. The Scots were ready first and disposed of before the Devons."

The Scots cost £7 12s. 10d. each, or £122 5s. 4d. They sold for £235 18s. 6d.; gain by grazing,	£113	13	2
The Devons cost £7 6s. 6d. each, amounting to £117 4s. and sold for £250. Deducting £18 14s. 6d. for the longer time in feeding, there remains £231 5s. 6d.; gain,	£114	1	6
Balance in favor of the Devons,	0	8	4

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"The remaining four of each breed were kept and stall-fed on turnips and hay. The Scots sold at £75, and the Devons at £84; the account of which will be as follows:—

4 Devons, cost £29 6s. sold for £84—gain	£54	14	0
4 Scots, cost £30 11s. 4d. sold for £75—gain	£44	8	8
	£10	5	4

(*Youatt.*)

Milking Properties.

"The *Long Horned* or Dishley Stock are now chiefly valuable as dairy cattle, and principally for cheese-making; and some cows will furnish from 400 to 500 lbs. of cheese each in the season." (*Youatt.*)

"The *Suffolk Duns* are said in the London dairies to give as much as 8 gallons of milk a-day, after calving, and six during a great part of the season."—(*Ib.*)

"In the Epping district, where no particular attention is paid to the selection of stock, and where there is an indiscriminate mixture of Devons, Suffolks, Leicesters, Holderness, and Scotch, the calculation in a well managed dairy amounts to 212 lbs. of butter, viz:—

6 lbs. per week during	26 weeks,	156 lbs.
4 " do. during	14 do.	56 lbs.
		212 lbs.

"Mr. Alton's calculation is, as we have already seen, 250 lbs. per annum, for the Ayrshire breed."—*Ib.*

"It has been calculated that the herbage that will add 112 lbs. to the weight of an Ox, will enable a dairy cow to yield 450 gallons of milk, which will give in butter and cheese a greater return than that afforded by the meat."—*Ib.*

"The *Highland Cow* will not yield more than a third part of the milk that is obtained from the Ayrshire; but the milk is exceedingly rich, and the butter procured from it is excellent."—*Ib.*

"Five gallons daily for two or three months after calving, may be considered as no unusual average for an *Ayrshire Cow*. Three gallons daily will be given for the next three months, and one gallon and a half during the succeeding four months. This would amount to 850 gallons per year, but allowing for some unproductive cows, 600 per annum may be a fair average. This milk may be estimated to yield 257 lbs. of butter or 514 lbs. of sweet milk cheese per annum."—(*Ib.*)

"The *Galloways* are not considered good milkers, but their milk is rich in butter. A cow that gives 12 or 16 quarts per day is considered very superior, and that quantity produces more than a pound and a half of butter. The average, however, of a Galloway cow, cannot be reckoned at more than six or eight quarts per day, during the

fine summer months after feeding her calf. During the next four months, she does not give more than half of that quantity, and for two or three months she is dry."—(*Ib.*)

"The following observations were made by Mr. Calver, of Brampton, on the quantity of butter yielded by one of his short-horns. The milk was kept and churned separately from that of the other stock, and the following is the number of pounds of butter obtained in each week:—7, 10, 10, 12, 17, 13, 13, 13, 15, 16, 15, 12, 13, 13, 13, 14, 14, 13, 12, 12, 13, 11, 12, 10, 10, 8, 10, 9, 10, 7, 7, 7. There were churned 373 lbs. of butter in the space of 32 weeks. The cow gave 28 quarts of milk per day, about Midsummer, and would average about twenty quarts per day for 20 weeks. She gave more milk when pastured in the summer than when soiled in the house, in consequence of the very hot weather. She was lame six weeks from foul in the foot, which lessened the quantity of milk."—(*Ib.*)

The produce of the *Alderneys* is thus noticed by Milburn:—

"The produce of these small animals both in milk and butter is very great, and may be taken in fair specimens at twenty quarts of milk daily and ten pounds of butter in the week, during the months of April, May, June, July and August. Instances are recorded of cows giving 26 quarts of milk in twenty-four hours, and yielding as much as fourteen pounds of butter per week! Fourteen quarts of the milk being capable of producing a pound of butter, the same quantity would give a pound and a half of cheese; and the whey or drainings of twenty pounds of this cheese would produce four pounds of butter, somewhat inferior for toast, but quite adequate to the making of pastry."

2. *Choice and Purchase of Cattle.*

The above description of the several breeds will be useful in this respect; but there are a number of subordinate points well deserving of attention, and which can be reduced to the form of rules. The following are copied almost verbatim from Youatt:—

"The first object of attention is to consider the proportion between his stock and the quantity of food that will be necessary to support it. The nature, situation, and fertility of the soils that compose his farm are equally worthy of notice, as well as the purpose for which he designs more particularly to rear or feed his cattle; and chiefly, whether for the dairy or with the view of supplying the markets. It will be expedient to observe the greatest exactness in these proportions; because in case he should overstock his land, he will be compelled to resell before the cattle are in a fit state for market, and, consequently at certain loss; while on the other hand, he will incur a diminution of his profit if he should not stock his land with as many cattle as it will bear."

"He should next endeavor to procure thoroughly good male animals; an extra ten or twenty pounds is always well bestowed thus; and he should decide on the breed or breeds he intends to keep; by purchasing and breeding from various different breeds indiscriminately, he will never have a good animal, and eventually his herd will be mongrels. Neither must he pursue the *in and in* system to any extent, or he will find his stock deteriorate rapidly."

As points deserving of careful consideration in the purchase of cattle, especially those intended for fattening, the following are enumerated:—

(1.) *Beauty* or symmetry of shape.

(2.) *Utility of form.*—The head should be fine and small, tapering toward the mouth. Few good milkers or feeders are without this fineness of muzzle. The neck should also be fine, but may thicken rapidly toward the shoulder. The chest should be deep and broad, and the back broad and level, and the animal ribbed almost home. The loins should be wide at the hips but not prominent; the thighs full, long, and near together; and the legs short. The bones of the legs should be small, the hide mellow but not loose—everywhere covered with hair soft and fine, but not effeminately so.

(3.) *The Flesh*—of course varies with age and food. It should, however, be marbled or intermixed with fat and lean; and when alive, should feel firm and mellow or elastic, and not hard or flabby.

(4.) *Cattle from richer or better ground* should not be purchased for poor or medium farms. The farmer should select such animals as have been found to suit the soil or keep he has for them. This last, however, should be improved if possible.

(5.) *Docility of disposition* is an object of great moment. Independently of its other advantages, tame beasts require less food to rear, support, and fatten them. Gentle, kindly, equable treatment will most effectually conduce to this end; and stock so treated are more valuable than those that have had their tempers spoiled by bad treatment.

(6.) *Hardiness of constitution*, is a matter of some importance. Cattle with arched ribs and wide chests and backs, are more likely to prove hardy than those that have their fore-quarters narrow.

(7.) *Early maturity* is also valuable, but it can only be maintained by feeding young cattle in such a manner as to keep them constantly in a growing state. A good breed well fed in winter, will thrive more in three years than in five with insufficient food in winter. It seems to be a generally received opinion that small cattle have a stronger disposition to fatten than the larger breeds, and will produce more meat per acre.

(8.) *The Age of Cattle* may be estimated by the teeth and horns: "Neat cattle cast no teeth until they are turned two years old, when they get two new teeth. At three they get two more; and

in every succeeding year two more, until five years old, when they are called full-mouthed; though the two corner teeth which are last in renewal, are not fully up until they are six."

"When two years old, the horns are without wrinkle at the base, but at three years old a circle or wrinkle appears, to which another is added every year, so that by adding two to the number of rings the age may be ascertained, unless the rings have been scraped or filed away. These circles must not be confounded with other ringlets sometimes found at the base of the horns, and which are a tolerably sure indication that the animal has been ill-fed during its growth; another frequent consequence of which is that the horns are crooked and unsightly. There is also a tip at the extremity of the horn, which falls off about the third year."

3. *Breeding of Cattle.*

On this subject, Youatt gives the following hints:—

"*The Bull* generally attains the age of puberty at twelve or fourteen months, and may be used moderately at that age without injury. Young bulls that have been suckled on a cow in the pasture, will generally serve cows more readily at an early age than those reared in the house. It is not advisable to put old or heavy bulls on young heifers. Neither is it well to allow the bull to run in the pastures with the cows, and especially is this practice injurious to young bulls, often spoiling their tempers, besides doing them other harm. Wherever the situation can be by any means made to admit of its being avoided, this should never be permitted. As it is desirable at times for the bull to have exercise, he should be allowed to have a loose box when young, and should be regularly rubbed down every day, and as he gets older led out occasionally. The temper of the animal much depends on the treatment he receives, nevertheless some bulls are naturally far more vicious than others."

"Although *the Cow* may be supposed to arrive at puberty at the end of eighteen months or even earlier, it is not generally advisable to put her to the bull before the age of twenty-two months or two years. Much, however, depends on the breed, the treatment and the constitution of the heifer. Some breeders hold that cows may be sent to the bull as early as one year old, but this is injurious either to the mother or offspring, and is generally considered injudicious. Some cautious breeders on the other hand defer it for three years, or even longer."

"The most judicious method of breeding is to employ males of superior shape, but yet of suitable size, and to couple them with females nearly as large if not larger. The nearer the other qualities of both approach to perfection, the better it will be for their progeny,

but it is material that even in their best points there should not be too great disparity. *Gradual improvements* will always be followed by certain ultimate success, while violent attempts to effect a *sudden change* will invariably disappoint expectation."

"The period of time during which cows are allowed to *run dry* previously to calving, is by no means settled. By some graziers they are recommended to be laid dry when they are about five or six months gone with calf; but repeated and successful experiments prove that six weeks or two months are sufficient for the purpose: indeed cows kept in good condition are sometimes milked until within a fortnight of calving. This, however, is a practice not to be recommended; for if a cow *springs* before she is dry, serious injury may ensue.

"As cows are very subject to *Abortion* when improperly treated during gestation, they ought to be watched with more than ordinary care during the whole of that period, and particularly the latter portion of it. The principal causes of abortion are violence or accidents, too good or too poor condition, hereditary predisposition, some epidemic or atmospheric influence, and lastly contagion or a tendency to slip the calf being propagated from one cow to another, from the irritable imagination of the beast. It is therefore a matter of prudence or almost of necessity to separate the cow that has slipped her calf from the rest of the herd, and it should not be forgotten that cows that have once slipped their calves are more liable than others to a recurrence of miscarriage. For about a month or six weeks before the time of calving, it will be advisable to turn the cow to grass, if in the spring; but if in the winter, she should be fed with the best hay and some turnips, potatos, carrots, or other winter fodder, or a mixture of bran and oats or bean meal. Should these not be at hand, the mere boiling of a portion of the hay, and giving it with the water, when cool, will be found to keep her body in a healthy state for calving, and also improve her milk. It is not desirable that she should be fattened, because the fatter a cow is the less milk she gives; and yet if she is too poor, there is danger lest she should drop in calving."

In ordinary circumstances, the cow should, in calving, be left to nature; but if any accident happens, or is likely, some experienced person or a regular farrier should be called in.

"After the cow has calved, she should be left quietly with her little one; it is cruel and dangerous to separate them. A warm mash should be given, and her water slightly warmed. In fine and dry weather she should be watched attentively, in case she should require aid, but no artificial means used unless she evidently needs assistance. On the following day she may be turned out about noon, and regularly taken in during the night, and this for three or four successive days."

After the calf is produced, it will sometimes be necessary to assist

the natural functions of the animal in removing the *secundines* or after birth, provided in the uterus for nourishing the fœtus, and which might become putrescent and produce considerable irration in the womb, and probably fever. There is no danger, however, that this will immediately take place, and a few days will pass before any material inconvenience will ensue. No attempt should be made hastily to remove it, unless there is evident inconvenience or danger from its retention. Cows will often eat this substance with avidity, and this is never known to be prejudicial to the health of the cow, but on the contrary it is believed to act as a medicine."

"It may be necessary to milk the cows three or four times a day, for two or three days, especially if they are full of flesh and the udder hard. The calf should be suffered to suck as frequently, if in the house; or if in the field to run with the mother and suck at pleasure; it being carefully observed that she does not prevent it from sucking, for if the udder or teats are sore she will probably drive it away, and danger of losing both animals may be incurred. Should the udder or teats become hard, knotty or tender, the most easy and effectual remedy will be to let the calf derive all its nourishment from sucking."

4. *Management of Calves.*

The selections under this head relate chiefly to the rearing of young calves, and to fattening them for the market.

"After the calf is produced, the cow should be allowed to cleanse it by licking. It is a very bad practice to give the calf gruel soon after its birth; the *biestings*, or first milk drawn from the cow, will be the best thing that can be administered to it. It is seemingly provided by nature as the first aliment of the young animal, and is both nourishing and medicinal."

"There are two modes of feeding calves: one is, to permit them to run about with their mother during their first year; the other is to wean them when a fortnight old, and bring them up by hand. The former method eventually produces the best cattle, and is adopted in those districts where fodder is abundant and cheap."

"Whether calves are intended to be raised for breeding, labour, or fattening, they should have a sufficient supply of good food: for if the supply of it is scanty at first, the animal will rarely if ever attain a considerable growth."

The time of weaning and early treatment of calves, vary much in different localities. The following are selected as examples of the *best* modes:—

"In several counties of England the calves are left with the cow for about ten days or a fortnight; and being taken from her, are taught to drink first new milk for a week or two, then new and skimmed milk mixed; and if after a month or so the calf seems thriving,

skimmed milk only is given, with oat or barley meal or crushed linseed, at first in small quantities and gradually increased in proportion to his age and growth. Small wisps of fine hay are then placed within their reach, which they begin by sucking and gradually become induced to eat. Turnips chopped small, or carrots and good sweet hay, may then be given to them, and when they eat well, linseed cake or oat cake are added. They should be liberally kept for the first six or eight months, and well housed and kept warm and clean.

"About three quarts of new milk daily are sufficient for the support of a young calf. It should be given regularly at stated hours, and he should be kept as quiet as possible, for rest will materially improve his growth."

"In Ayrshire, calves intended to be reared for dairy cows, are fed for four, five, or six weeks, and allowed four or five quarts of new milk at each meal. Some farmers give no food but milk until they begin to eat grass, &c., which is generally about the fifth week. The milk is wholly withdrawn about the end of the seventh or eighth week. If reared in winter, the milk is continued longer. Others feed with meal after the third or fourth week, or gradually introduce some new whey with the meal, and afterwards withdraw the milk. Hay tea, linseed jelly, oat and wheat meal porridge, treacle, &c., are sometimes used with advantage, but milk when it can be spared is by far the best, as it is the most natural food."

"Even young cows," says Aiton, in treating of the Ayrshire dairy husbandry, "intended for the dairy, should be fed from the time they are calves on food suitable for milch cows, and treated nearly as their dams. Such food and treatment have the greatest tendency to form the milk vessels of the young cows, and rear them with dairy qualities. It is by such treatment that a calf is formed into a dairy cow, and those who wish to rear and keep a dairy breed in any thing like perfection, must provide them with an abundance of such food as is suited to the production of milk, when they are young, when they are full grown, when they are in milk, and when they are *yell*."

There can be little doubt that the Ayrshire breed owes much of its excellence to the practice of this rule, and it will be found impossible to rear first rate animals if they are starved when young.

"In Devonshire, the calves are permitted to suck as much as they like, three times a day, during the first week or ten days; after which they are suckled by hand, and fed with warm new milk for three weeks longer. They are then fed for two months, twice a day, with as much warm skim milk as they can drink, in which some feeders mix a small portion of finely powdered linseed cake or meal. After this the meals of milk are gradually abated, and at the end of four months the calves are wholly weaned, and fed on hay, chopped roots, oatmeal, &c., until they go to pasture."

The following American methods are more economical, though probably not so well calculated for rearing superior animals :—

"Mr. Budd, of Boston, pursues the following mode:—take the calves when three days old, from the cows, and put them into a stable by themselves; feed them with gruel, composed of one-third barley, two thirds oats, ground together very fine and sifted. Each calf is to receive a quart of gruel morning and evening, which is to be made in the following manner:—to one quart of the flour add twelve of the water, boil half an hour and let it stand till milk warm. In ten days tie up a bundle of soft hay in the middle of the stable, which they will eat by degrees. A little of the flour put into a small trough for them to lick occasionally, is of service. Feed them thus till they are two or three months old, increasing the quantity. Three bushels of the above mixture will raise six calves."

"Mr. Cleft, of New York, takes the calf from the cow at two or three days old; he then milks her, and while the milk is warm teaches the animal to drink by holding its head into the pail. If the calf will not drink, he puts his hand into the milk and a finger into the mouth, until the young one learns to drink without the finger. After feeding with new milk for a fortnight, the cream is taken from the milk, and with the latter an equal or larger portion of thin flax-seed jelly is mixed, and the whole given milk warm. Thus, as the spring is the most advantageous season for making butter, he is enabled, during the six or seven weeks that the animals are kept previously to weaning, to make as much butter as they are worth." This is a good method, as the oil of the linseed serves instead of the cream of the milk.

"The successful rearing of calves," says Youatt, "very much depend on the *regularity* and *frequency* of feeding them. The common practice is to supply them with food twice in the day, viz: in the morning and at evening, when they generally receive as large a quantity as will satisfy their craving appetite. Hence the digestive organs are necessarily impaired, and too many animals either become tainted with disease, or perish from the inattention of their keepers; whereas by feeding them thrice or even four times in the day, at equidistant intervals, and allowing them sufficient space for exercise, they will be not only preserved in health, but greatly improved in condition."

"Whatever food is allowed to calves, care should be taken not to change it suddenly. A calf should have attained a certain degree of strength before it can dispense with the food most natural to its age, or thrive without the aid of milk; this fluid should therefore be allowed as long as possible. Even when that has been withdrawn, and the animal has begun to eat grass, hay or artificial food, the milk or the substitutes that have been employed in lieu of it should be partly continued until he prefers the pasture. It is a common notion, that provided young stock acquire size, their condition is immaterial; and after the first winter they are often turned into the roughest pasture, and kept during the following winter on chapped straw, with

perhaps a little indifferent hay. This, when they are intended to be sold to the fattening grazier, may be the most profitable mode; and in some situations it may be the only one that can be adopted; but when they are to be reared for the breed, it is absolutely necessary as the only means of bringing them to perfect maturity, and improving every good quality, that they should be kept on good pasture during the summer, and allowed roots with some sound hay in the winter, and green food in the spring. A contrary mode, however apparently economical, is decidedly disadvantageous; for the worst breed will ultimately be improved by good feeding, while the best will degenerate under a system of starvation."

Judge Peters, of Prince Edward Island, gives the following as the result of his experience:—

"Calves should be well fed for three months, and put on good grass; and well fed during the next winter, using every day an allowance of turnips. It is by no means necessary to let them suck, or to give them new milk. The Complete Farmer gives the following directions:

'The method pursued by Mr. Crook, as mentioned in the letters and papers of the Bath and West of England Society, is as follows:—He purchased three sacks of linseed, value two pounds two shillings, which lasted him three years. One quart of seed was boiled in six quarts of water, for ten minutes, to a jelly, which was given to the calves three times a day, mixed with a little hay tea. And he states that his calves thrive much better than those of his neighbours, which were fed with milk. Thus it seems that less than eighteen cents worth of flax seed, with a trifle of hay, is sufficient for one calf.'

'If skim milk is given to calves, it should be boiled, and suffered to stand till it cools to the temperature of that first given by the cow. It is better boiled than when warmed only. If the milk be given too cold, it will cause the calf to purge; if this is the case, put two or three spoonsful of rennet into the milk, and it will stop the looseness. If the calf is bound, pork broth is said to be a good and safe thing to put into the milk.'

"I have reared several calves with flax seed jelly, and find it an excellent plan. To save the trouble of making hay tea, I caused a small quantity of boiled skim milk to be mixed with the jelly; and when the calf is about six weeks old, add a handful of oat or indian meal. By this means, the dairy turns out as much butter as if no calves were rearing. I purchased one bushel of flax seed, and after rearing two calves, had more than a peck left."

The *Fattening of Calves* for the butcher, is a subject of careful attention in Great Britain. Here the chief care seems to be to produce the lowest marketable condition at a cheap rate, only a very low price being calculated on for the veal. The following hints may be useful in enhancing the quality of the article.

Youatt sums up the best condition for fattening calves as follows: "The best way is to keep them in somewhat dark places, in pens, lest they should fatigue themselves by sporting too much in the light; and to feed them on milk, with the addition of bean, pea, or barley meal, during the last few weeks. Cleanliness should be particularly attended to. For this purpose the pens should be elevated to such a height that the urine may pass freely, and litter should be supplied every day, in order that they may lie dry and clean. A large chalk-stone suspended over the pen is useful, as by licking it the acidity of stomach from which calves are apt to suffer is corrected."

To produce the very finest veal, it seems established by experience that the calves should be fed on milk alone; and this in such quantity and quality as to make them fit for the butcher, in from six to seven weeks.

"The district of Strathaven in Scotland, is celebrated for the excellence of its veal. The calves are fed on milk alone, and are fed by hand. At four weeks old the calves receive the entire milk of one cow. At six or seven weeks each calf receives the milk of two cows. The best feeders disapprove of eggs and meal, which they say darken the flesh." At the price procured for the veal in Scotland, the farmers calculate that they receive for the milk used, at the rate of about 2d. per quart. The low prices procurable in this country will rarely warrant so large an expenditure of milk.

5. *Draught Oxen.*

Under this head will be found some remarks on the training of working cattle; and facts bearing on two questions much agitated in this country—the best mode of yoking oxen, and the comparative merits of horses and oxen.

"In training the ox, the only method by which success can be attained is patience, mildness, and even caresses: compulsion and ill-treatment will irritate and disgust him. Hence great assistance will be derived from gently stroking the animal along the back, and patting him, and encouraging him with the voice, and occasionally feeding him with such aliments as are most grateful to his palate. When he has thus become familiar, his horns should be frequently tied, and after a few days, a yoke put upon his neck. After this, he should be fastened to the plough with an old tame ox, of equal size, and employed in light work, which he may be suffered to perform easily and slowly. The youngster will thus be gradually inured to labor. After working in this manner for a certain period, the steer should be yoked with an ox of greater spirit and agility, in order that he may learn to quicken his pace: and by thus frequently changing his companions as occasion may allow, he will in the course of a month or six weeks be capable of drawing with the best of the stock."

"Another circumstance of essential importance in breaking-in young oxen is, that when first put to work, whether at plough or in teams for draught, they should not be fatigued or over-heated, until they are thoroughly trained; therefore it will be advisable to employ them in labor only at short intervals, to indulge them with the rest during the noon-day heats, and to feed them with good hay, which, in the present case, will be preferable to grass. In fact, while oxen are worked, they must be kept in good condition and spirit."

"The general character of the ox is patience and tractability. If young steers sometimes prove refractory and vicious, it is in most instances the result of defective management, or of bad treatment when first broken for the yoke. When an ox is unruly or stubborn, it will be advisable to keep him until he is hungry; and, when he has fasted long enough, he should be made to feed out of the hand. On his returning to labour he should be tied with a rope. If he at any time becomes refractory, gentle measures should always be attempted, in order to bring him to work readily and quietly."

In working oxen to advantage much depends on the mode of harnessing them, and the question—"whether it is most advantageous to yoke oxen by the head or collar," has occasioned much discussion, and is even yet undetermined. In Britain they are yoked by the collar, and this mode prevails in our Province. In Spain and Portugal, as well as various other parts of Europe, they are yoked by the head, and draw by a cross beam of wood, which lies across the back of the neck, immediately behind the horns, and is secured by strong straps or ropes passing over the forehead. In the county of Lunenburg this method is in general use, having been introduced by German settlers. Comparative trials, which it is not necessary to occupy space by detailing, have been made in England and elsewhere, and the results seem to show that oxen may be trained to do their work about equally well in either mode. My own observation inclines me to believe, that while for heavy loads and slow work, neck draught may be preferable, the head harness is better in other circumstances. It seems natural to the ox to use his power by the head and neck, by lowering and raising his head he can suit himself to the inclination of the ground, and he appears to move with much greater freedom and ease than when hampered by a neck-yoke. It would appear, however, that in Britain, the use of proper harness for oxen, as for horses, is now preferred to the ruder method formerly in general use. They are also very commonly shod, which is effected by aid of the *trevis* or by casting them, or by accustoming the animal from his youth to have his feet handled and hammered.

The *comparative merits* of draught oxen and horses are very variously estimated in different parts of the Province. The advantages of the ox are its smaller cost, its greater steadiness, and its value for fattening. These advantages must always recommend it to new set-

tlers, and for breaking up new land. On the other hand, horses are quicker, an inestimable advantage in our climate; they can be used to advantage for a considerable term of years without changing, or the trouble of breaking in new animals; they suit a greater variety of work; and can perform extra labour in proportion to the extra expense of their keep. For these reasons, the improvement of agriculture is accompanied in most counties by the gradual abandonment of the ox as a labouring animal. On this subject, Youatt remarks:—

"Some trials have shewn that three oxen, if highly fed, are equal to the work of two horses; but the additional expense thus created of superior keep, destroys the supposed advantage of economical food. It must also be observed, that oxen if worked to the extent of their power, will become of little value to the grazier; for they cannot stand hard work and maintain high condition; and if once reduced, it is afterwards extremely difficult to restore them. Experience has indeed proved that, keeping in view the profitable sale of oxen and working them accordingly, four will be required to perform the labor of two horses."

Professor Johnston, in his Report on New Brunswick, expresses a very similar opinion:

"Of the qualities and prices of yoke oxen I have little experience, and I doubt the profit of using them in what may be called pure farming. For ploughing among stumps and stones, and for hauling timber in the woods, they may be superior to the less patient and quicker horse; but the farmer who owns an extent of cleared and stumped land, and attends only to his farming business, will not find time in the short seasons of New Brunswick to wait on the laggard footsteps of such oxen as I have seen at work in the Province. I have been told in the State of New York that oxen are to be had with a step nearly as quick as that of ordinary farm horses, and which will do nearly as much work. But such cattle, to do the work, require to be fed nearly as well as the horse, so that the alleged economy in feeding oxen, in comparison with horses, in this case disappears; and the advantage of feeding them into bad beef at the end of eight or nine years, and selling them for six or eight pounds to the butcher, is nearly all that remains to compensate for the loss of time which, with the best of them, the farmer must always experience. Where wages are complained of as being high, a very small amount of this time will exceed in value the price obtained, after a series of years, for the worn out ox."

6. *Feeding and Fattening of Cattle.*

This subject may be divided into three departments of grazing, soiling and stall feeding:

(1.) *Grazing.*—There can be no doubt that the important subject

of pasturage merits more attention than it receives from most farmers. Early spring pasturage, and good green food for the dry months of autumn, are especially worthy of consideration, as much of the stock suffers seriously from being turned out early on insufficient pastures, and being allowed to subsist in Summer on scanty, coarse, and dried up vegetation. It is to be hoped that increased attention to the rotation of crops, and the proper condition of hay land, will enable farmers to lay out hay land, after the second and third crop, to pasture in good heart; and that land will be sown with grass and white clover for permanent pasture on a larger scale than at present. Boussingault maintains that permanent pasture affords more nutriment than grass land of any other kind. Stephens, on the contrary, while admitting the successful use of permanent pasture in England, states that Scottish practice is in favor of having no permanent grass land, on farms which the plough can make arable. These differences probably depend on soil and climate, and it is certain that only dry or well drained soils in good heart, are fitted for this use, excepting of course the pasturage obtained on marshes or natural meadows. Youatt remarks:—

"In stocking lands, as the proportion of beasts must depend upon the fertility of the soil, it will generally be found that local custom will afford the surest guide. In the counties of Somerset and Devon, one acre or one acre and a half of the better kinds of land are allotted to one ox, to which a sheep is sometimes added. The best grazing land in Lincolnshire, we are told will, under favorable circumstances, support one ox and a sheep on an acre during the whole summer; and the former will gain 20 stones or 280 lbs., and the latter 10 lbs. a quarter, or 40 lbs."

"In order to graze cattle to advantage, it is profitable to change them from one pasture to another, beginning with the inferior ones and gradually removing them to the best. By this expedient, as cattle delight in variety, they will cull the uppermost or choicest part of the grass; and by filling themselves quickly, and lying down frequently, will rapidly advance toward a proper state of fatness, while the grass that is left may be fed off with laboring cattle, and lastly with sheep. Hence it is advisable to have several enclosures, and abundantly supplied with wholesome water. When cattle are turned into fields of clover or rich grasses, they are liable, by too great eagerness in feeding, to become *blown or hoven*. This may be prevented by feeding them well before they are turned in, to diminish the cravings of appetite."

In this Province, large fields are often allowed to run out into natural grass, after being cropped or cut for hay for a series of years. By this wasteful practice, a large surface of poor pasture, scarcely worth fencing, is produced. If land is worth cropping, it should pay for seeding down to pasture with grass and with clover; and if so sown, it would not only furnish better pasture, but would far more rapidly

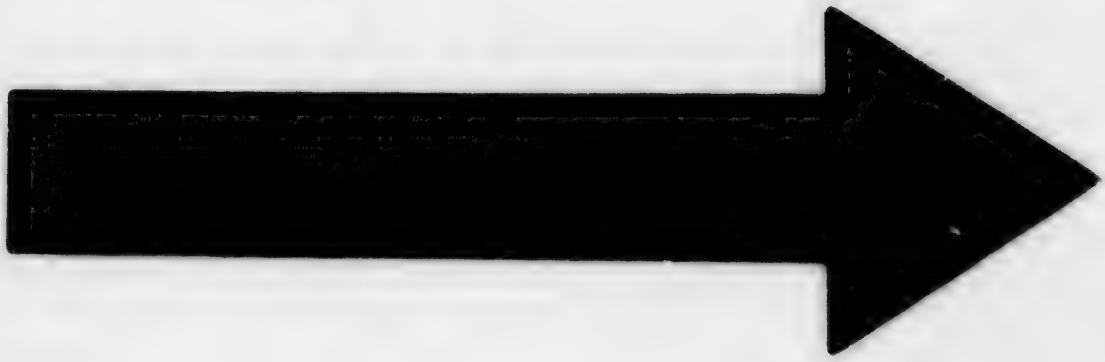
regain some degree of fertility. As a general rule, land should be broken up for cropping only when it can be sown down to hay in good heart, and after cutting for hay for a few years, it should be allowed to remain in pasture till required again in the regular rotation. If it should be necessary to break up land for cropping without putting it through a regular course with manure, it should at least receive seed to fit it for pasture. Where tracts of land in this neglected and unprofitable state already exist, they may be much improved by top-dressing with any kind of animal or vegetable refuse, ditch cleanings, swamp muck, marsh and creek mud, lime, gypsum, ashes, &c. Even scattering over the surface the manure that cattle leave on it, and cutting the ranker weeds, and leaving them to rot on the surface, will be found useful.

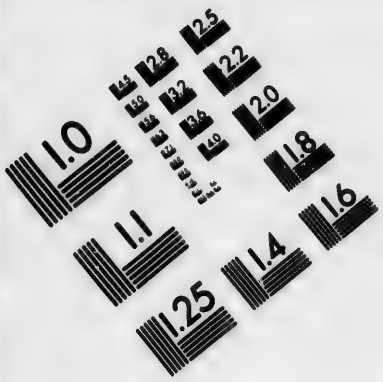
Every pasture should have some shelter, to which cattle may resort for protection from cold winds and the burning sun. In England, sheds are often erected for this purpose; but hedges, trees, or clumps of bushes preserved or planted for the purpose are better and cheaper. They may be in such positions as to improve the appearance of the farm, and not to interfere with cultivation.

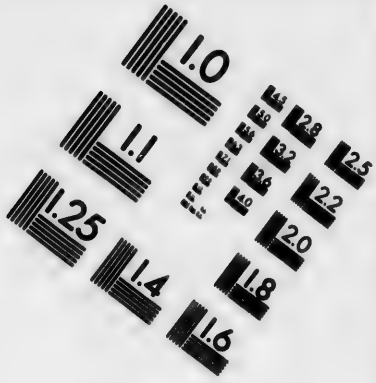
(2.) *Soiling of Cattle*—or feeding by means of green food cut and conveyed to them, has many advantages, especially on small and rich farms; and *in part* at least it may always be advantageously followed. Its advocates recommend it on the following grounds:—the saving of land, one acre of good grass being equal to two or three used as pasture—the saving in quantity of food consumed—the improvement in the health and comfort of the cattle, by being constantly sheltered—the increase of manure obtained, the summer manure being saved. Youatt thus sums its advantages and defects:—

"The facts and inferences above stated, fully prove the advantages of soiling. It ought not, however, to be concealed that there are some disadvantages attendant on the soiling and stall-feeding of cattle, such as the additional labour and expense of cutting and carting the green vegetables home to the sheds, both in winter and summer; but they are more than counterbalanced by the saving in food that is effected—by the increased productiveness of the land and the diminished waste—by the thriving of the cattle—the making of the dung under cover, and having reservoirs in which to preserve the urine. It has also been objected, that where large quantities of food are accumulated for a considerable time, they are liable to fermentation, and of course to waste. Such is the case with cabbages, turnips, and other roots, but it may to a very considerable degree be obviated by paying due regard to the storing of the various vegetable crops, and their economical consumption."

"It has likewise been objected by the opponents of soiling and stall-feeding, that the cattle are heated by being confined during the summer months, and that their health is injured; but this will not be







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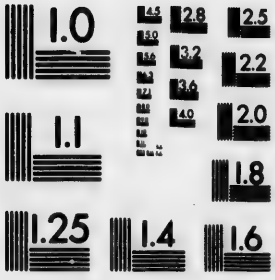

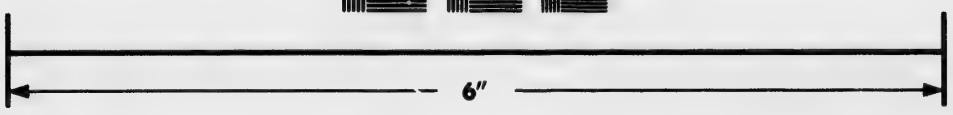

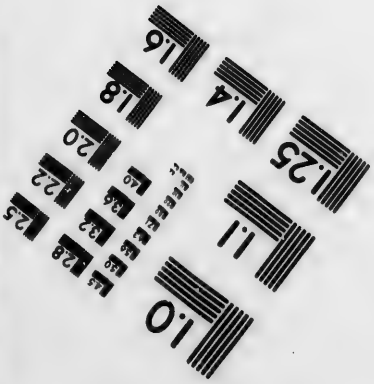

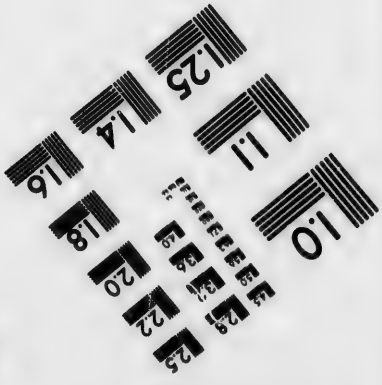

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the case where stalls are so constructed as to admit a regular circulation of air, and at the same time afford shelter from the attacks of flies. The cattle may also be allowed the freedom of an open yard; indeed in that season *fold yards*, with open sheds, are by many preferred to stalls. This is the practice in Yorkshire, where the management of stock is well understood; indeed there is no scientific grazier who is not a strong advocate for perfect ventilation, even during the inclemency of winter. Plenty of good and wholesome air is indispensably necessary to the preservation of the health and the fattening of animals."

(3.) *Stall and Box Feeding.*—In fattening cattle, stall-feeding should commence when the animals are half or three parts fat, a condition to which they can attain on good pasture. Of course, however, the remarks under this head apply to the method of soiling already mentioned, as well as to the winter feeding which forms so important a part of the farmers' cares in this country. "Of all vegetable productions, *good hay* is undoubtedly the best for fattening cattle; in ordinary circumstances, however, it is necessary to have recourse to other things in combination with it, as cabbages, carrots, turnips, beets and other succulent plants. Barley, rye, oat or pea meal, if mixed together, with the occasional addition of a small quantity of bean meal, may likewise be given to advantage, in the proportion of a quarter, or at most half a peck to each beast, along with hay. Of hay it may be observed, that that which is salted, even if of somewhat inferior quality, is preferable to that which is unsalted." The comparative value of the different roots, &c., will be mentioned under another head.

Various kinds of *prepared food* are in use for cattle, the principal of which are the following:—

Flax seed when crushed and boiled to a jelly. There is probably nothing equal to this for rapidly fattening cattle.

Three parts bean; pea, oat, or barley meal, with one part of linseed meal made into a jelly, form an excellent food.

Turnips, carrots, mangel wurtzel, cabbage, &c., when boiled and mixed with flax-seed meal, form another useful variety.

The following is stated to be a daily allowance of one of these compounds:—

3½ gallons water.
2 lbs. linseed meal.
5 lbs. barley meal.
10 lbs. chaff.

The following admirable hints are well worthy the careful study of every farmer:—

"A most important object in the feeding or fattening of cattle is that such arrangements should be made, and such a supply of food provided for winter consumption, that the grazier may be enabled to

keep them throughout that trying season, and sell them when meat brings the highest prices, viz., from the beginning of February to the end of May. Thus he will not only obtain more for them than the autumnal markets will produce, but his stock will go off freely, and every market be in his favour. He will also obtain a considerable quantity of manure, and consequently be enabled to conduct his business to the greatest profit.

"Whatever articles of food may be given, they should be apportioned with as much regard to *regularity of time and quantity* as is practicable; and if a portion of it is at any time left unconsumed, it should be removed before the next meal, otherwise the beast will possibly refuse or loathe its food.

"In stall feeding it is too common a practice to give a certain allowance every day, without regard to any circumstance; but it is well known that a fattening beast will eat with a keener appetite on a cold day than in warm damp weather; and his food should be proportioned accordingly. By giving the same quantity every day, the animal may be cloyed. His appetite will become impaired, the food will be wasted, and several days will pass before he feeds heartily again. *Three periods of the day*, and as nearly equidistant as possible, should be selected as the feeding hours, when only such an allowance should be given to each animal as it can eat with good appetite. As it fattens, its appetite will probably become more delicate, and it will require more frequent feeding, and in smaller quantities; thus the beast will improve progressively and uniformly, while only a trifling quantity of the food will be lost. (It will be useful, if convenient, to *weigh* the animal occasionally, to ascertain how it thrives on the kind of food given.) Of equal importance with regularity in feeding is *cleanliness*, a regard to which is admitted by all intelligent breeders to be essential to the health and thriving of cattle. The mangers and stalls should be kept as clean as possible; and the former, if they cannot be washed, should be cleaned every morning from dust and filth, which may easily be effected by a common bricklayer's trowel, or similar instrument. They otherwise acquire a sour, offensive smell, which will nauseate the cattle, and prevent their feeding.

What is called *box-feeding*, consists in enclosing the cattle in close stalls or boxes, 8 or 10 feet square and 12 feet high. The lower part is sunk in the ground, so as to form a sort of tank in which the manure is suffered to accumulate, and is said to be more effectually saved than by any other mode. Fresh straw is scattered over the surface every day. The cattle are not tied in these boxes. This appears a filthy mode, and at best is only suited for the latter part of the process of fattening cattle for the butcher. Cattle are said to thrive sufficiently well in the boxes, and the manure when thus trodden into a mass and then mixed with urine is more valuable. "Under all circumstances, however, a good and sufficient bed of litter is indispen-

cable" to the health and comfort of feeding cattle. The surface at least of their bed should be clean and dry.

Under this head I place the following extracts from Prof. Johnston, on the subject of prepared food for cattle :—

"The use of what is called prepared food, is also a means of improvement which deserves the serious consideration of the New Brunswick farmer. The oily seeds, such as linseed, are a most valuable food for animals, and an admixture of them, with the other fodder, is not only beneficial of itself, but enables the farmer also to use up easily and profitably the straw of his grain crops in sustaining his cattle, and to convert it at the same time into more profitable manure.

"In the present condition of Agriculture in New Brunswick, I do not recommend the Provincial farmer to purchase linseed as the British farmer does, for the purpose of feeding or fattening his stock, and for the production of a rich manure for his corn fields. But the growth of a small proportion of flax upon his farm, besides yielding the fibre upon which in the winter season the members of his household may employ their leisure hours, will furnish them with a quantity of seed which will greatly benefit his stock, and which will enable him to adopt with profit the more artificial system of feeding to which I am now referring. To give an idea of this method, and of the practical results obtained from the adoption of it, I make the following extracts from my published Lectures on Agricultural Chemistry :—

"The method adopted is, to crush the linseed, to boil it by a steam heat for three hours, with two gallons of water to each pound of the seed, and then to mix the hot liquid with the chopped straw and tail corn, in the following proportions :

Linseed, - - - - - - -	2 lbs.
Cut Straw, - - - - - -	10 lbs.
Ground Corn, - - - - - -	5 lbs.

This quantity is given to each full grown beast per day, in two messes.

The liquid is poured upon the mixed corn and straw on the floor of the boiling house—is turned over three times at intervals, and at the end of two hours is given to the cattle. They have two hot messes a day, and are fed punctually at the same hour.

"The times of feeding are, turnips at six in the morning, prepared food at ten, turnips at one, and prepared food again at four in the afternoon. The allowance of turnips is sixty pounds of Swedes per day, or seventy-five lbs. of Hybrids, or one hundred and twelve pounds of Globes. Under this system, the cattle thrive remarkably, are still and quiet, lie down the greater part of the day, and though they cause a large outlay at first, in the purchase of linseed, they amply repay it in the value of the dung, and in the higher price they return for the turnips and for the tail corn than could be obtained in any other manner.

"It is not necessary, in adopting this method, that the precise details above given should be followed out—that the same quantity, or proportions, of the several kinds of food should be employed—or that the crushed linseed should be boiled by a steam heat. The principle of adding turnips to the hay usually given to the cattle and sheep, and to both a certain quantity of linseed, boiled long enough to form a jelly when it cools, mixed up with chopped straw, and brought to the stock either cold or hot—this is what the farmer may, in nearly all circumstances, profitably adopt."

Judge Peters thus states his experience :—

"I have tried flax seed in fattening two or three cattle, but having no means of crushing it, I boiled it for two hours, and mixed the jelly and seeds with crushed barley, oats, or Indian corn. I gave one pint of seed and two quarts of meal, thus prepared, every day to each beast; its effects were soon visible in the silky appearance of the hair, and the more thriving condition of the animal." Respecting shelter, he says: "There is another point connected with cattle, which requires attention. There are generally no yards to your barns; there should be high close fences, or sheds, inclosing a space for a yard to shelter the cattle; all, however, cannot afford to make them, but all can fence in a small space adjoining their barn, to keep in their cattle, and prevent their wandering about the roads in winter, by which a pa t of their droppings is lost. Again in the coldest weather you see the cattle out all day, exposed to the cutting winds, and half perished with the cold. In mild weather, it is well to let them out in the yard; but on severe days they had much better be in the stable, unless your yard affords very good shelter for them. The stables can easily be made warmer, by nailing up side longers, or slabs, inside to the posts, and filling the space with sea weed, moss, straw, or tan bark, well stuffed down."

The following additional facts and hints on English feeding are from Youatt :—

"Brewer's grains are sometimes given to cattle in an acid state; but distillers' grains differ from them in having a proportion of rye frequently mixed with the malt, rendering them more than naturally sour. Acid mixtures, however, can only be considered as preparatory to the more forcing and essential articles of dry food, without which it is impossible that any bullock can acquire the firmness of muscle and fat, which is so deservedly considered as the criterion of excellence.

"The *wash* or refuse of malt remaining after distillation, which was formerly applied exclusively to the feeding of Swine, has of late years been used with some success in the stall-feeding of cattle. It is conveyed from the distillery in large carts, closely covered and well jointed, in order to prevent leaking. The liquor is then discharged into large vats or other vessels; and when these are about two-thirds

full, a quantity of sweet hay, previously cut small, is immersed in it for two or three days, in order that the wash may imbibe the flavour of the hay before it is used.

"One of the most successful instances of this mode of fattening cattle that has occurred within our observation, is that of Messrs. Hodgson & Co., the proprietors of Bolingbroke House Distillery, Battersea, near London. Between October and April, which is their regular working season in the distillery, they fatten about 450 cattle, having generally about 350 in the house tied up at one time, and 100 in an adjoining orchard, which are taken in to replace those that are sold off. From ten to sixteen weeks is the usual time of fattening, and the cattle are found to gain upon the average the extraordinary quantity of from two to three stones per week. Their food is wash, grains and hay—sometimes meadow and at others clover hay,—and occasionally alternated with oat or barley straw, which is sometimes, though not regularly, cut into chaff. Hay and straw are given to them twice a-day, in order that they may ruminate; and they have as much grains and wash as they can eat. In general they readily take to this kind of food, but some are four or five days before they lose their aversion to it. According to their quality, the cattle are supposed to pay from ten to twenty shillings per week."

"The *relative proportion* of food consumed by fattening animals necessarily varies according to the size of the animals, and the nutriment afforded by the respective vegetables. It has, however, been found that an ox will eat nearly one-sixth *per diem* of his own weight of cabbages. Fattening beasts require half a hundredweight of turnips daily, besides an adequate allowance of dry meat to counteract the superabundant moisture of these roots. For middle-sized animals a bushel or a bushel and a half of distiller's or brewer's grains will be sufficient, if combined with an ample portion of dry meat, given in the intervals of the distribution of the grains. Bullocks varying from forty-five to sixty stones, consume about eight or ten stones of carrots or parsnips per day, besides an additional quantity of dry provender, that is in the proportion of one-sixth part of their own weight; and as an acre of good carrots will yield 400 bushels or 22,400 lbs., it would support such an animal 160 days, a period sufficiently long for beasts to be kept that have had the summer's grass. If they are half-fat when put to carrots, an acre would probably be sufficient to fatten two such beasts. Of potatoes, small cattle—such as those of Wales and Scotland—eat every day about a bushel a-head in a raw state, with the allowance of a truss of hay divided between four beasts. To an animal of 80 or 100 stones, about 10 to 15 lbs. of pulverized oil-cake are given daily, with at least a stone of cut hay during seven or eight weeks; the allotment of cake is then usually increased to 15 or 20 lbs., until the animal is sufficiently fat for sale. Whenever it can

be conveniently arranged, the animals should not be confined to one sort of food. To mingle the food judiciously, benefits the beasts and saves the farmer money; for an animal will thrive better and cost less if fed on hay, turnips and oil cake, given in the proportion of one part cake, four parts hay and seven parts turnips, than he would if suffered to eat the whole amount in one only of these matters.

"It has been found that forty-five oxen, well littered while fattening with twenty waggon loads of stubble, have made two hundred loads, each of three tons, of manure; the greatest and most valuable part of which would have been lost, had it not been mixed with and absorbed by the straw. Every load of hay and litter given to beasts fattening on oil-cake, yields at least ten tons of dung; and on comparing the dung obtained by feeding on oil-cake with that of the common farm-yard, it has been found that the effects produced by spreading one load of the former on an acre considerably exceeded those of two loads of the latter. The value of the manure will invariably be found to be in proportion to the nutriment contained in the aliment. It is an old and true proverb, 'No food, no cattle; no cattle, no dung; no dung, no corn; or indeed any other good crops.'"

Oil-cake cannot ordinarily be obtained in this country; but flax-seed is of course more fattening, and may often be easily procured. It should be either bruised in a machine for the purpose, or well boiled. It is the oil contained in the flax-seed or oil-cake that gives them their fattening property. Hence it has been proposed to mix cheap oils, for instance, cod-fish oil, with the food of cattle, in small quantities; and there can be no doubt that, in moderate quantity, they will produce this effect; though there can be as little doubt that, in excess, they will injure the flavor and quality of the beef.

(4.) *Driving Fat Cattle to market.*—The following tests are given by Youatt as showing the fitness of the animal for the butcher, and his capability of standing the journey to market: "The general appearance of the animal shows high condition, and each bone is covered with flesh in the manner required to constitute as perfect symmetry as can be attained by a perfectly fat animal; the hips and huckle bones are round, and the ribs, flank and rump and buttocks well filled up, and his scrotum or purse largely developed and round. The ends of the fingers should be pressed upon him in various parts, as the ribs, hips, rump and purse. If there is an evident elasticity of these parts, and they spring back when the fingers are removed, that mingled firmness and softness well described by the term *mellowness* exists, and this is a sufficient assurance that the flesh is of thoroughly good quality."

Such being the condition of the animal, his journey to market, when there are not such facilities as railways or steamboats, should be performed in the following manner:—

"Some preparation should always be made for the journey, when the animals have to be driven far. Their food should undergo some change. The green food should be diminished, and the dry food increased, in order to prevent looseness on the road. They should be loosened from their stalls a short time twice in the day, for two or three days previous to their setting out, in order to accustom them a little to exercise, and prevent that giddiness by which they would probably be attacked after being so long confined, and also to prevent any of the dangerous pranks which they may be inclined to play on the road. That farmer would be wise who put them in the trevis and had them shod, for on long journeys several of every large herd are usually left behind and become expensive, or are sold to disadvantage, on account of their hoofs being worn through by the roughness of the roads. They should start slowly, and during the first two or three days should not be driven more than seven or eight miles per day. In winter they should be put into a court or shed at night, and in summer turned into a pasture; gradually the day's journey may be increased to twelve or fourteen miles, but it will be dangerous to extend it beyond that distance. Plenty of time should be allowed for its completion; for if the cattle are hurried on the road, even if they do not exceed the number of miles above mentioned, they will be distressed and off their feed, and the foundation may be laid for serious disease. It is scarcely credible how different will often be the state of droves that have performed their journey in the same number of days. There will be a stone difference in the weight of each beast, and double the value of that in the quality of the meat. It is impossible to estimate the mischief when cattle have been over-driven, and he who is acquainted with them will be very cautious how he purchases animals having that appearance."

For information on the *diseases* of cattle, I would advise the reader to consult Cole's "American Veterinarian," a very valuable little work, which should be in the hands of every farmer.

CHAPTER VI.

THE DAIRY.

Under this head will be noticed the food and management of Milch Cows, and the making of butter and cheese.

1. "Cows of the same and of the best breeds will not always yield the same quantity of milk; and the milk of those that yield the most is not unfrequently different in richness. These points, however, which are of great importance to the dairy, may be easily determined by keeping the cows on the same food, weighing the quantity consumed by each, measuring their milk, and then keeping and churning it a few days separately. Comparisons of this kind are not frequently made, for farmers usually purchase whatever stock they can most conveniently or most cheaply obtain, and are then content to keep them as long as they turn out tolerably well. This nevertheless, is exceedingly bad economy, for an indifferent cow will eat as much and require as much attendance as the best, and occasion a daily loss that will soon exceed any saving in the original price. The man who takes the pains to acquire a good stock, and has the sense to keep it, lays a sure foundation for doing well."*

In illustration of the truth of the above remarks, I quote the following from a late volume of the Massachusetts Agricultural Transactions:—

"A few years since, one of the committee had a farm which was leased on shares, appropriated to dairy purposes, on which 25 cows were kept, which were owned in common by himself and the tenant. Accidental circumstances induced a comparison between a cow which was considered the most valuable in the herd, because she yielded a large supply of milk, and a cow which had been purchased at a small price. Repeated trials were made by the lactometer, and the result was that the milk of the cow which had been held in high estimation afforded cream of only 4-10 of an inch in thickness; and the same quantity of the milk of the low-priced cow gave cream of the thick-

*Youatt.

ness of 1 and 4-10 of an inch, and of a much yellower colour than that of the other. The cheap cow was in reality the most valuable animal. The cow which had been so highly esteemed had been in the dairy two years or more."

"Dr. Anderson, the distinguished Scotch writer on the dairy, mentions an instance of one cow, from whose milk no butter could be made. She was purchased of a farmer who kept a large dairy, by a person who had no other cow, and thus the discovery was made. Thrown into the general mass, her milk had been useless, and her keeping a dead loss to the farmer. Hence the Doctor judiciously recommends the setting, in a separate pan, the milk of every cow, to ascertain its quality, that such as give meagre milk may be fattened and sent to the slaughter-house. And we would urge it upon every farmer to test all his cows, both as regards the quality and quantity of milk they severally yield, confident as we are that by this simple process, and disposing of such cows as he thus finds cannot be profitably kept, the profits of his dairy will be increased, and the character of his cows be transmitted with more certainty to their offspring."

The following general remarks on the qualities and treatment of dairy cows are quoted from the American Patent Office Reports:

"The *qualities* of a dairy cow are of still greater importance than her shape. Mildness and docility of temper greatly enhance the value of a milch cow: one that is quiet and contented feeds at her ease, does not break over fences, or injure other cattle, so much as those that are of a turbulent cast. To render them docile, they ought to be gently treated, frequently handled when young, and never hunted with dogs, beat, or frightened. A moderate degree of hardiness, life and spirits, with a sound constitution, are desirable qualities in a dairy stock, and all these are found in the Ayrshire. Some have mentioned it as a valuable quality when a cow subsists on a small portion of food; but that will depend upon the quantity of milk which one so fed will yield. If any cow gives much milk on a little food, it is one of the best qualities she can possess; but of this I entertain doubts, which forty years' experience, inquiry and observation have served to corroborate and confirm. I have heard it asserted that some cows will yield as much milk, and fatten as fast, when fed on coarse, as others will on rich food; but I never met with, nor do I ever expect to see, such cows. The old adage, so common in Ayrshire, that 'a cow gives her milk by the mou',' has always held good, so far as I could perceive. It is of the greatest importance for dairy cows to be fed, from their earliest days, on food that has a tendency to produce the milky secretion, and even to be fed on that description of food when not giving milk. It was common in former times to rear young cows for the dairy on moors and healthy ground, and only to lay them on better pastures and dairy food when they came into milk; but this has been found to be an improper mode of rearing a

dairy stock, and they now fare much better in their youth than they did in former times. When young cows of the dairy breed are reared on moors or bad pasture, and get only as much fodder as keeps them alive, they grow up what in Ayrshire is termed '*a rough beast*,' with large horns, coarse hair, thick skin, high bones, and other marks of a starveling, and they *never after become good milkers*. But when they are fed on better pasture and provided with some green food, and good fodder during the winter, they grow up proper dairy cows, having the shapes and good qualities that have been enumerated. In former times, no other attention was paid to the dairy stock during the winter but to keep them alive. They were fed on the worst and coarsest of oat straw, or ill-preserved bog hay, cut from the marsh meadows and frequently half rotted in drying. The consequences were that the dairy cows went out to grass in May mere ghosts, lean, weak, and meagre, with their milk vessels dried up. Hence the summer was far advanced before the cows either gave much milk, or that which was of good quality. A lean, starved cow never gives so much nor so good milk as one that is in proper habit of body."

On the same subject Youatt says :—

"It will generally be found that, supposing the food to be the same, those cows that yield the least in quantity have the richest milk; but both quantity and quality are affected by the mode of feeding. When kept on old meadow grass (permanent pasture), the butter will have a better flavour than when the cows are fed on artificial grass, or even on land that has been recently laid down to pasture; and although brewers' grains or cabbages, turnips, and other succulent roots will increase the quantity of milk, yet hay, corn, oil-cake and meal will add most to its richness. Lean cows never yield either so much or so good milk as those which, without being actually fat, are kept in proper condition."

The above requisites for good milking cattle, may be summed up as follows :—

(1.) Cows of a good milking breed, in fair condition and comfortably housed in winter.

(2.) Food in such quantity and of such quality as to afford the elements of the fatty and cheesy parts of the milk. Grass and roots add to the watery part of the milk, but also contribute largely to its butter and curd. Grain and good hay give much of the cheesy constituent. Flax seed and Indian corn are particularly rich in the cream or butter making ingredients.

2. *The Food* of milch cows in general consists of the same materials already referred to, in speaking of the fattening of cattle. The following extracts give the opinions and practice of some of the best British authorities on the subject:—

"In pasturing cows, it is to be observed that the quantity and quality of the milk are materially affected by driving them to a distance from one pasture to another. It is proper, therefore, that the pasture of milch kine should not be too distant from the cow sheds. It is also of essential importance that the pastures should be properly enclosed and sheltered, for when confined within proper enclosures, cows will feed more leisurely, and are better protected against bad weather; moderate warmth and quiet are greatly conducive to increase of milk."

"Every endeavor should be made to keep milch cows at all times in high health and good condition. If they are suffered to fall in flesh during winter, it will be folly to expect an abundant supply of milk by bringing them into high condition in the summer. If cows are lean when calving, no subsequent management can bring them to yield for that season the quantity of milk they would have furnished had they been well fed during the winter. It is not easy to persuade farmers to afford high feeding to unproductive stock, nor is it requisite for cows that are dry; but the common practice of keeping them during that period on the poorest fodder is very objectionable, and the injury to the future produce of the cow will greatly exceed the saving in provender. During the winter, therefore, some nutritious food should be provided for them, and the animals be kept moderately warm; for they will thrive more and eat less when kept warm than when they are shivering with cold. When fed on straw or coarse hay alone, until towards the time of calving, the vessels secreting the milk become inert and powerless, and will not afterwards yield either much nutriment or of good quality, until the beasts are turned out to pasture. The milk of lean cows is always poor and as deficient in quantity as in quality; it is therefore important that milk kine should be maintained at all times not only in good condition, but in what may be termed a *milking habit*. For this purpose a small quantity of any of the succulent roots will be found sufficient, in addition to their usual dry food. A few Swedish turnips will be essentially useful in preventing costiveness, hide-bound, and the drying up of the milk; and will be conducive, not only to the present health of the animal, but to her preservation in that state of constitution in which she will be most fit to profit by the superior nourishment to be obtained in the spring."

"Good sweet hay is the staple winter food of a milch cow; the accessaries are those usually employed in feeding and fattening cattle. Swedish turnips, pea or bean meal, and oil cake or flax seed, will render the milk richest. But carrots, mangel wurtzel, potatoes, and parsnips, may be given with nearly equal profit. Indeed, on the continent, the mangel wurtzel is preferred to other roots for feeding cattle, and many accounts are given of the nutritive powers of the potatos. One bushel per diem, with good meadow hay, is said to

cause a cow to yield as much milk as she would when fed on the finest pasturage."

"Steamed food is generally admitted to produce more and better milk than raw."

"In Holland, where the management of cows is carried to the highest perfection, they are curried in the same manner as horses, and kept as cleanly. The invariably high condition of the Dutch dairy stock is the surest proof of their good management, the chief features of which are—care in keeping the animals dry, as well as clean, and attention to the purity of the water."

"In Yorkshire, the winter keep of milch cows is straw chopped and hay, with Swedish turnips. In several parts of England steamed or parboiled chaff is very commonly fed to cows. In Scotland pea meal is a frequent article of food for cows, and a mixture of a bushel of chaff with 8 or 10 Swedish turnips and 3 lbs of pea meal, boiled together, is highly recommended. This mixture is given morning and evening, with hay in the meantime. To remove the flavor of Swedish turnips from the milk, a little saltpetre is mixed with the cream."

"*Sea weed* has of late years been given to cows in Scotland as a substitute for turnips, and is said to be very nutritious. The common rock weeds are used, and are given in the first instance boiled, and afterwards raw. Each cow receives, once or twice a-day, as much of the weed as a person can conveniently carry at once between his hands." I am not aware that this has been tried in this Province, but it might be a useful resource in times of scarcity.

Salt is highly recommended as an addition to the food of milch cows. It improves the digestion, renders inferior food palatable, increases the quantity of milk, and is said to remove the disagreeable flavor occasioned by turnips.

"The following bill of fare of the cows kept in the county of Middlesex, for the supply of milk to London, will astonish many persons in this country, but it may be useful as showing how much food may be profitably given to large and fine breeds of milch kine:—

"3 o'clock, A. M.—Each cow a half-bushel basket of brewer's grains.

7 to 8 o'clock.—Two half-bushel baskets of Swedish turnips and one-tenth of a truss of good hay. (The cows are then turned out into the air, and are tied up again at 12.)

12 o'clock.—Half-bushel basket of grains.

3 o'clock.—Feed of turnips and hay, same as in the morning."

The following plan of feeding adopted by Mr. Ralston, of Fineview, Scotland, one of the largest dairy farmers in that country, is more applicable here:—

"Until the grass rises, and affords a full bite, the cows are kept in their houses, but are then sent to pasture. In hot weather they are

fed on cut grass in the houses, from 6 in the morning to 6 in the evening, and are out at pasture all night, as the soil is dry and sandy. When rainy weather comes, house-feeding is discontinued. In harvest when the pastures begin to fail, the cows are fed partly on second clover, and partly on turnips scattered over their pasture. As the weather becomes colder in October, they are housed at night, and in severe weather during the day, also receiving at night cut straw and turnips. These roots are partly stored, and the supplies of them managed so as to protract the feeding. When they fail, Swedish turnips and potatoes (to which in this country mangel wurtzel and carrots may well be added) follow with dry fodder. Chaff, oats and potatoes are boiled for the cows after calving; and the calves get rye-grass and clover hay, in the latter part of spring. The cows employed are of the Ayrshire breed."

Steamed Chaff may be given to cows with great advantage. Mr. Curman used a steam-boiler containing 100 gallons, on each side of which were fixed three boxes containing each 11 stones of chaff, (cut hay and straw with the husks of grain,) and this by being steamed gained more than one-third of its original weight. The steam was conveyed by various stop-cocks into the lower parts of the boxes, which were mounted on wheels to be drawn to the place where it was intended to be used; but the chaff required to stand for twelve hours before it could be eaten. Mr. Curman estimates the daily cost of food for each cow as follows:—

Chaff, 2 stones, in 2 meals, and steaming,	1d.
Oil-cake, 4 lbs.,	4
Turnips, 1 cwt.,	4
Wheat straw,	1
	10d.

"The average of milk on a stock of 36 milch cows was nearly thirteen wine quarts for 320 days; sold at 2d. per quart. The calves brought from £2 to £5 when reared. The produce is stated by Mr. Curman to be nearly half clear profit, estimating the manure as equal to the calves. The cows were never turned out; and to prevent their becoming lame, their hoofs were properly pared, and they stood with their fore feet on clay. One great advantage attending this method, was, that most if not all the milch cows were in such condition that with a few weeks' feeding after they were dry, they became fit for the shambles, with very little loss."

"As an occasional substitute for chaff and oil-cake, Mr. C. recommends cut hay, which, when steamed, would make a much superior food, and greatly augment the milk, as well as benefit the health and condition of the animals. There can be little question that this is superior to straw; for straw, or even the husk of grain which is said to contain more nutriment than straw, can add but little to the product

of milk. It may keep store animals from starving, but it will never improve their flesh; and it may be received as an axiom, in feeding all animals, that the value of the food is in proportion to the nutritive matter contained in its component parts. Bulk is necessary to sustain the action of the stomach; but it serves no other purpose."

"Mr. Curman gave cooked food from October to June—nearly eight months out of twelve—and his plan of treatment was adopted by several farmers in different parts of the kingdom, with the most complete success. It is partially practised in the Isle of Man, where the cottagers have long been in the habit of pouring boiling water on the chaff with which they winter-feed their cows. It has also been adopted in some parts of Scotland. There are, however, many practical and scientific men who still decidedly object to cooked food of any kind, and particularly roots, being given to milch cows."

Pea Meal is given by some of the Scotch dairy men, by whom it is said that no food is found to produce so much profit. The following method of preparing it, combined with chaff and turnips, as customary at Kyle, in Ayrshire, and which we copy from a recent publication, seems to merit particular attention:—

"Take a bushel of chaff and eight or ten sound yellow or Swedish turnips, having the tops and tails carefully taken off, and boil them together four or five hours. Add as much water as will cause the hand to move freely through the mass. Squeeze down the turnips and add three pounds of pea meal. Give this to a cow in the morning and the same in the evening, with as much sweet hay as she will eat up clean five times a day; and without much expense her butter will be as rich and of as fine flavor as can be produced in winter. Should the peculiar flavor of the turnip be detected, which is not likely, a small quantity of saltpetre put to the cream will remove it."

3. *The Building for the Dairy* should be convenient, but not exposed to effluvia from the cow-house or farm-yard; and it should be maintained, as far as possible, at an equal temperature. A pump or spring of water within, is a most valuable addition to it. In Britain, such buildings are constructed of stone and brick, with walls of great thickness; and great care is taken to secure cleanliness and to exclude excessive heat or cold. In this country, in cases where convenient and cleanly underground cellars cannot be employed, buildings of wood, filled in with saw-dust, eel-grass, or dry tan bark, will answer the purpose well. Where possible, the combination of a dairy with an ice-house, is very desirable. The following extracts are given, not as being especially adapted to this country, but as shewing the care employed in the construction of these buildings in Britain, where the extremes of temperature are so much less than with us:—

"If it can be managed, it should be well sheltered by trees, or the situation of the ground. The grand principle of construction should be

to preserve an equable temperature in winter and summer. A pump should always open into the dairy. The walls should be thick, so as to preserve, if possible, the proper temperature, or from 50° to 55° of Fahrenheit's thermometer. Some have recommended double walls, with a space of one or two feet or more between the wall and the lath and plaister. Mr. Marshall advises walls six feet thick, one foot on the inside to be brick or stone—the outside of earth and sod. The roof should be of thatch, and three feet thick, and should project over the walls. The floor may be sunk a few feet below the surface, but must be quite free from damp. The dairy should be paved with stone brick or tiles, with the joinings well cemented together. It should be washed daily in summer, but great care should be taken to dry it immediately, as damp rapidly promotes the putrefaction or turning of milk. A butter dairy should have three compartments, one for receiving the milk, one for churning, and the third for cleaning the vessels. A cheese dairy requires a fourth for storing the cheese."

When an equable temperature cannot otherwise be obtained, stoves and other means of artificial heating are employed; and in large dairies the churning or cheese-making room is supplied with boilers for warming water, milk or whey. There has been much difference of opinion respecting the most suitable material for *creaming dishes*. Earthenware answers well; but in Scotland cast iron dishes, tinned inside, are affirmed to throw up one-third more cream than any others: and in the United States tin dishes are very generally preferred. It seems in general that metal vessels, by more rapidly cooling the milk, give more cream than others.

4. *Composition and Properties of Milk.*—The milk of the cow consists, according to Henry and Chevalier, as quoted by Professor Johnston, of—

Casein, (pure curd,) - - -	4.48
Butter, - - - -	3.13
Milk sugar, - - - -	4.77
Saline matter, - - -	0.60
Water, - - - - -	87.02
	100.

These proportions vary, however, in the milk of different cows, and in that of the same cow under different circumstances.

Milk, like most of other animal fluids, is liable to a variety of chemical changes, on which its various uses greatly depend.

(1.) When left at rest for several hours the butter or fatty matter, which in the fresh milk was merely mechanically mixed, separates and floats to the surface, where, still in a state of partial mixture with the other ingredients, it constitutes cream. Even in the cow's udder the cream tends to rise to the surface; hence the last drawn portions

of milk are the richest. The more the milk is stirred or agitated in milking or after, the less readily does the cream rise; and the deeper the dishes in which it is kept, the more slowly does the cream rise. In the former case the creamy particles are more thoroughly mixed with the whole milk, and in the latter they have more milk to rise through.

(2.) When the cream is allowed to sour, or soured by the action of the churn, the curdy and oily parts become completely separated from each other and from the watery part, and the butter is collected in a pure state.

(3.) The *casein* or *curd*, though itself insoluble in water, is kept in a state of solution in the new milk by the agency of a little alkaline matter, chiefly soda, which renders it soluble in the whey. When the milk becomes acid, whether by the change of its sugar into lactic acid, or the acid of milk, or by the addition of an acid or of rennet, the casein becomes insoluble, and forms curd, which, by the application of a gentle heat, may be consolidated and separated from the whey.

(4.) The remaining whey contains much of the saline matter of the milk, its sugar or the acid produced from it, and usually small residual portions of the fatty and cheesy matters.

In addition to distance from the time of calving, and other well known causes, the following are the principal circumstances which effect the quality and quantity of milk:—

(1.) *Age of the Animal.*—Cows yield the best milk after their third or fourth calf; and after this time it continues to be excellent, until they are ten or twelve years of age.

(2.) *Climate and Season.*—Moist and temperate climates are favorable to the production of much milk. In hot and dry climates the quantity is less but the quality richer. Cool weather favours the production of cheese and sugar in the milk; warm weather that of cream. Exposure to intense cold diminishes the quantity and deteriorates the quality.

(3.) *Time of Milking.*—A cow milked only once a day will yield a little more butter than if milked more frequently. When milked three times a-day, the quantity of milk is much increased. The morning's milk is of better quality than that of the evening.

(4.) *Treatment and Temper of the Animal.*—The best milking condition is one of quiet and repose. Every thing that frets, annoys, or disturbs the animal, or excites her to great muscular exertion, interferes with the secretion of the milk.

(5.) *The Race or Breed of the Animal.*—This is of much importance, but has been already noticed.

(6.) *The Kind of Food.*—Many important facts will be found under the head "Food of Milch Cows," but the experiments hitherto

made have failed to shew those marked differences which we should have anticipated from great changes of food. The reason is that the secretion of milk on a particular day is not dependent solely on the food of that day; and that many causes are in operation simultaneously:—

(7.) *The Form and Constitution of the Individual Animal.*—Much information on this subject will be found under other heads. Youatt says:—"A milch cow should have a long thin head, with a brisk but placid eye; should be thin and hollow in the neck, narrow in the breast and point of the shoulder, and altogether light in the fore quarter—but wide in the loins, with little dew-lap, and neither too full fleshed along the chine, nor showing in any part an inclination to put on much fat. The udder should especially be large, round and full, with the milch veins protruding, yet thin-skinned, but not hanging loose or tending far behind. The teats should also stand square, all pointing out at equal distances and of the same size, and although neither very large nor thick towards the udder, yet long and tapering toward a point. A cow with a large head, a high back bone, a small udder and teats, and drawn up in the belly, will, beyond all doubt, be found a bad milker."

It is quite certain that cows of the same breed and age often differ materially in their produce of milk; and though the form is a good guide, this also often fails to be a certain indication. It is therefore useful for the dairy farmer to test by experiment the actual quantity and quality of the produce of each cow when in different conditions, and thus to ascertain the real value of the different individuals of his stock. This is the more necessary as it appears that certain breeds and kinds of animals may thrive better or worse on certain farms or kinds of feeding than on others.

5. *The Making of Butter*—being a very important part of dairy husbandry, and the qualities produced by different makers being very different, I give here an abstract of some of the best methods in use in Britain and America, with some preliminary hints on milking and creaming:

"In milking, if a cow is roughly handled, it is not only painful to her but will cause her to withhold a portion of her milk, whereas if it is gently drawn, she will yield it freely. It is of importance that it should be drawn to the last drop, for the last part is the richest; and whatever milk is left in the udder is liable to coagulate and injure the udder as well as lessen the subsequent 'meals of milk.' It sometimes happens that cows are restless and fidgetty; but they should by no means be harshly or severely treated at such times. If the udder is hard or painful, it should be fomented with lukewarm water, and gently stroked, by which simple expedient the cow will generally be brought into good temper and readily yield her milk. It is also pro-

per to feed the cows at the time of milking, for while eating they give out their milk with greater freedom."

"It is a well known fact that cows, when milked thrice in the day, yield more in point of quantity, and milk of as good if not better quality, than they will under the common mode of milking them only morning and evening.

"Very particular directions should be given that the cows are driven slowly to the place of milking. If they are hurried in ever so slight a degree, the creaming of the milk will not so readily or perfectly take place. In like manner, milk should never be much carried about or allowed to cool in the pails, before being put into the milk pans."

"The milk should be poured through the strainer into the milk-pans, which should not exceed three inches in depth. The milk-pail should then be rinsed with about a quart of cold water, which also may be poured through the sieve into the milk-dish. If any flavour of turnips, &c., is apprehended, add one-eighth part of boiling water to the milk, or a few drops of a strong solution of saltpetre."

"Thick milk diluted with water, produces more cream than if not diluted, but of inferior quality. Thick milk produces less cream than thin, but of supreior quality."

"It is best to put the milk of each cow into the cream-pans separately, or at most the milk of two or three cows together. By these means unnecessary agitation will be avoided, and it will be possible to know the different qualities of the milk of different cows.

"To make butter of extra fine quality, the milk of those cows that yield a poor quality, should be rejected, and also the milk first drawn from each cow."

"The cream having separated, in about twenty or twenty-two hours, may be removed by skimming, or the milk may be let out by taking out a plug in the bottom of the pan. When collected, the cream should be placed in a deep covered vessel, and stirred every time a fresh quantity is added. If the cream from each milking has been kept separate, it may remain from two to four days in warm weather before being churned; but if sweet cream is mixed with that which is sour, they ferment and become putrid if the churning is delayed beyond three days. This may be in some degree prevented by stirring, but it is generally considered best to keep the cream from each milking apart, and thus allow each to become sour by itself.

"In some countries the separation of the cream is not thought to be sufficiently complete by this mechanical process; but after the milk has remained from twelve to twenty-four hours in the pan, it is put over a slow fire, where it remains until the first bubble raises the surface of the cream. The pan is then taken off, and put away for eighteen or twenty-four hours to cool. At the end of this time, if the quantity of milk is considerable, the cream will be an inch or

more in thickness. It is cut with a knife into squares, removed by a skimmer, and called *clotted* or *clouted* cream. It has a peculiarly sweet and pleasant taste, churns readily, and gives a butter retaining the same agreeable flavour. The remaining milk, however, is nearly worthless."

"*The churning* requires considerable art. It must not be too rapid or violent, nor must it be too slow and gentle. In the first case, and especially in summer, it would become ill-tasted and ferment,—in the latter it would not form at all. The temperature should be carefully regarded. In summer it will be necessary to immerse the pump churn about a foot in cold water, or to pour water over the rotatory churn. In winter, a little warm water should be added."

"In washing the butter, which may be done on a board, the great object is to squeeze out and wash away every particle of buttermilk, without beating or handling the butter too much. Abundance of water may be used, as this will remove nothing that is useful to the butter, and it is of great importance to keep the hands as cool as possible during the operation.

In Holland, and some parts of Ireland and Scotland, the whole milk is churned without any creaming. In Holland the process is as follows:—

"The milk is put into deep jars in a cool place, each portion milked at one time being kept separate. As soon as there is the least appearance of acidity, the whole is placed in an upright churn. When the butter forms in kernels, the whole is poured on a seive which retains the butter and allows the milk to pass through."

In Scotland the process is somewhat different:—

"The new milk is placed for six or twelve hours in coolers. It is then emptied into a large vat or tub. If the vat is sufficiently large, and a second meal of milk has become cold before the first shows any acidity, the two are mixed together. A lid or cover is then put on the vat, and it remains undisturbed, till the milk has soured, and has formed a *lapper* or curdled. When in this state it is fit to be churned, but may remain in this state two or three days, if the lapper is not broken; if broken, however, it must be churned immediately, else the whole will be spoiled. When put into the churn, the clotted milk is agitated for a few minutes, and as much hot water added as will raise the temperature to about 70°. The churning will then occupy from two hours to two hours and a half, and the butter will be sweet and good."

It would seem that the quantity of butter does not vary much, whether the cream or the whole milk is churned; and the preference will be given to one or the other, in proportion to the demand that there may be for skimmed milk and skimmed milk cheese, or for butter milk.

On the average yield of butter per cow, and the quantity which a good one well fed should yield, Youatt remarks:—

"Four gallons of milk will generally produce about a pound of butter, and a good cow, in order that dairy husbandry may remunerate the farmer, should yield 200 lbs. in the course of the year; besides this, there is the value of the calf, the skimmed milk, and the butter milk." In applying such a calculation to this country, we have to consider the lower price of butter and the higher price of labour here than in England, and on the other hand the high rents and taxes which the English farmer pays. It must also be observed in calculations of this kind, that it is the *extra feed*, above that required for sustaining life and keeping up condition, that pays the whole profit. A cow capable of yielding 200 lbs. of butter, may be fed in such a manner as to give little or no return. Every additional pound of good food gives a proportionate profit; and when fed up to that point which enables the animal to yield the largest amount and best quality of milk of which she is capable, the profit is greatest.

The following brief account of butter-making in the State of Maine, is from the Patent Office Reports for 1852:—

"For the past year I find the product of my dairy to have been 125 pounds of butter per cow, which is probably not far from a fair average; though, on account of the severe drought, this estimate may be too low. The cost of cheese is usually considered as half that of butter, though the making of the latter here is regarded as most profitable, as butter is not imported into the State in so large quantities as cheese, as it does not bear handling and transporting so well as the latter. In the treatment of milk for making butter in the winter, we pursue a course somewhat peculiar, which is as follows: After setting the milk in common milk pans for twelve hours, scald it, by setting the pans on iron vessels of boiling water, on a common cooking stove, and, after cooling, skim the cream off. By this mode of treatment the butter does not become bitter, as usual with winter butter, and is nearly as yellow as summer butter. Besides, by this course, the process of churning is very much accelerated. The process before mentioned is pursued by some in making summer as well as winter butter. Our rule for salting butter is, 1 ounce of finely pulverized rock salt to the pound of butter, applied after thoroughly excluding all the butter-milk, by washing in cold water and rolling with a common rolling pin; then pack in a clean barrel, either in lumps or solid, and completely cover with pickle as strong as it can be made; then add a bag of coarse rock salt, and see that there is always undissolved salt in the bag. Butter made and packed in this way we find to keep perfectly sweet the whole year. Average price of butter here is fifteen cents per pound."

The Salting of Butter is performed in England as follows:—

"The firkins are seasoned by frequent washing, and exposure to the air, or by scrubbing the firkin with salt and water boiled. It is

then dried, and salt strewed on the surface, before the butter is put in. In the ordinary process of salting, after separating the buttermilk as completely as possible, salt in the proportion of about one ounce to a pound of butter is worked in thoroughly, so as to become incorporated with the mass; for if not equally mixed in every part, the butter will acquire two colours, or become 'pyety' or pinsowed.' The salt should be of the purest kind, well dried and broken down, but not completely pulverized. Bad salt will soon cause it to become rancid. The following preparation is recommended as better than salt alone."

> "Two parts beat salt, and one part each sugar and saltpetre, well mixed; one ounce to each pound of butter. Incorporate it thoroughly with the mass, and close up for use"

"It will be necessary to keep butter thus prepared for two or three weeks after it is cured, before using; as otherwise it will not taste well; but if properly cured according to the above prescription, it will continue perfectly sweet for three years or more."

"After strewing salt on the bottom of the firkin, the butter may be packed in, thoroughly moulding each layer into that beneath it. When the cask is full, more salt should be strewed on the surface, and the head put on. If the butter has been well freed from milk, and the salt moulded into it quite dry, it will not shrink from the cask. This is always regarded as one criterion of the goodness of the butter."

6. *Cheese-making* is much more difficult than the manufacture of butter, and much less successfully practised in Nova Scotia, no part of which, with the exception of Annapolis, is celebrated for making a good article. The temperature at which the milk is kept, and at which it is curdled, is of great importance; and want of knowledge in this point is a frequent cause of failure. The milk should be kept beforehand at a temperature not under 50° nor over 55°. It should be curdled at a temperature which, according to different authorities, may vary from 85° to 95°. If the temperature be too high, the curd will be tough; if too low, it will be soft, and difficult to separate from the whey. Every cheese-maker who has not thoroughly learned by experience to distinguish the exact temperature, should have a thermometer, which can be purchased for a few shillings, for the purpose.

"The greatest care should be taken to extract every particle of whey from the curd; for the cheese is apt to heave when any whey remains; and if any part becomes sour, the whole will acquire a disagreeable flavour. Similar effects are produced by the use of an immoderate quantity of rennet. It is also apt to fill the cheese with

small holes, which imperfection will likewise be produced if it is allowed to remain too long on one side. The cracking of the cheese usually arises from the exterior drying too fast, and is caused by the air of the cheese-room being too dry or warm. An experienced dairyman is of opinion that from nine to twelve months are requisite to ripen cheese of any kind, if from fourteen to twenty pounds weight; and he lays it down as a rule that the hotter it is put together the sounder it will be; and the cooler, the richer and the more apt to decay. He also recommends the use of a small quantity of *loppered* or sour milk to prevent its poring. It is a good practice to strew a little moss or fine hay on the shelves on which the cheeses are laid, to prevent them from adhering and contracting dampness We add, as general maxims, that great cleanliness, sweet rennet, and attention to the heat of the milk and breaking the curd, are the chief requisites in cheese-making."

The following extracts describe the processes employed in making some of the most generally esteemed kinds of cheese:—

Cheshire Cheese.—"The evening's milk is set apart until the following morning, when the cream is skimmed off; it is then poured into a brass pan, heated with boiling water, in order to become warm; one-third part of that milk is thus heated.

"The new milk obtained early in the morning, and that of the preceding night being thus prepared, are poured into a large tub, together with the cream. Into this is placed a piece of rennet, which had been kept in warm water since the preceding evening, and in which a little Spanish Arnatto (a quarter of an ounce is enough for a cheese of sixty pounds) is dissolved. The whole is now stirred together, and covered up warm for about half an hour, or until it becomes curdled; it is then turned over with a bowl and broken very small. After standing a little while, the whey is drawn from it, and as soon as the curd becomes somewhat more solid, it is cut into slices and turned over repeatedly, the better to press out the whey."

"The curd is again removed from the tub, broken by hand into small pieces and put into a cheese-vat, where it is strongly pressed by hand and with weights, in order to extract the remaining whey. After this, it is transferred to another vat or into the same, if it has in the meantime been well scalded, where a similar process of breaking and expressing is repeated, till all the whey is forced from it. The cheese is now turned into a third vat, previously warmed, with a cloth beneath it, and a tin hoop or binder put round the upper edge of the cheese, and within the sides of the vat; the former being previously enclosed in a clean cloth and its edges put within the vat. These various processes occupy about six hours, and eight more are requisite for pressing the cheese under a weight of 14 or 15 cwt. The cheese during that time should be twice turned in the vat. There

are several holes bored in the vat which contains the cheese, and also in the cover of it, through which long skewers are passed in every direction, the pressure being still continued. The object of this is to extract every drop of whey. The pressure soon obliterates all these punctures, and the cheese is at length take[illegible]he vat, a firm and solid mass."

"On the following morning and evening, it must be again turned and pressed; and also on the third day, about the middle of which it should be removed to the salting chamber, where the outside should be well rubbed with salt, and a cloth binder passed round it, which serves as a lining to the vat, but is not turned over the upper surface. The cheese is then placed in brine extending half way up it in a salting tub, and the upper surface is thickly covered with salt. Here it remains for nearly a week, being turned twice in the day. It is then left to dry for two or three days, during which it is turned once, being well salted at each turning, and cleaned every day. When taken from the brine, it is put on the salting benches, with a wooden girth round it of nearly the thickness of the cheese, where it stands about eight days, during which time it is again salted and turned every day. It is next washed and dried, and after remaining on the drying-benches about seven days, it is once more washed in warm water with a brush, and wiped dry. In a couple of hours after this, it is scoured all over with sweet whey batter; which operation is afterwards frequently repeated; and lastly, it is deposited in the cheese or store room, which should be moderately warm, and sheltered from the access of air, lest the cheese should crack, and turned every day until it has become sufficiently hard and firm. These cheeses require to be kept a long time; and if not forced by artificial means, will scarcely be sufficientiy ripe under two or three years.

Much of what is called *Double Gloucester* and *Cheddar Cheese* is made by the following simple process:—

"When the milk is brought home, it is immediately strained into a tub, and the rennet added, in the proportion of about three table spoonsful to a quantity sufficient for a cheese of twenty-eight pounds; after which it remains undisturbed about two hours, when it becomes curdled, and is then broken to pieces. That being done, three parts of the whey are warmed, and afterwards put into the tub for about twenty minutes. The whole whey is then again placed over the fire, made nearly scalding hot, and returned into the tub, in order to scald the curd for about half an hour longer, after which part of the whey is again taken out, and the remainder left with the curd till it is nearly cold. The whey is then taken out or poured off, the curd broken very small, put into the vat and pressed; it remains there nearly an hour, and is then taken out, turned, and put under the press again until the evening; when it is turned again and left until the next

morning. It then finally leaves the press, and is salted once a day for twelve days."

"*Dunlop Cheese* is made in the counties of Ayr, Renfrew, Lanark, and Gallaway, of sizes from twenty to sixty pounds. After the milk is brought to a proper degree of heat it is mixed with the cream, which had been previously skimmed and kept cool. The milk is then poured into a large vessel, where the rennet is added to it, and the whole is closely covered up for ten or twelve minutes. If the rennet is good, it will have curdled the milk which is gently stirred. The whey then begins immediately to separate, and is taken off as it gathers, until the curd becomes tolerably solid. It is now put into a strainer, the cover of which is pressed down with any convenient weight. After it has stood for some time, and is tolerably dry, it is returned into the first vessel or dish, where it is cut into very small pieces by means of a cheese knife. It is thus turned up and cut every ten or fifteen minutes, and also pressed with the hand until all the whey is extracted. The curd is now once more cut as small as possible, and salted, care being taken to mix it minutely with the mass. Lastly, it is put into a *chesset* or *chessart*, a stout dish with iron hoops that has a cover fitting exactly into it—a cloth being placed between the curd and the vessel. In this state it is submitted to the action of the cheese press, whence it is occasionally taken and wrapped in dry cloths, until it is supposed to have completely parted with the whey. It is then laid aside for one or two days, when it is again examined; and if there is any appearance of whey, the pressure and application of cloths are repeated. As soon as it is ascertained that the whey is extracted, the cheese is kept for a few days in the farmer's kitchen, in order to dry it before it is placed in the store, where a smaller degree of heat is admitted. While there it is turned three or four times a day, until it begins to harden on the outside, when it is removed to the store and turned twice in the week afterwards. When the cheese is cured, various modes are adopted to polish it for sale, but these are injurious rather than beneficial, nothing farther being requisite, besides turning it, than to rub it occasionally with a coarse cloth, especially after harvest, for at that time it has a tendency to breed mites."

In making *Skim Cheese*, the principal difference is that the rennet and cheese should be put together cooler, otherwise the cheese will be hard and flinty. Very particular directions for making skimmed milk cheese, and also butter-milk cheese, will be found in Stephens' Farmer's Guide. The latter is prepared by heating the butter-milk till the curd sinks, separating the whey, salting, and hanging up in a coarse linen bag.

It is generally admitted that no part of farming is more steadily profitable than the dairy when well managed, but none requires more

skill and more close and unremitting attention to render it productive. It deserves, therefore, and requires, that every detail of every process should be carefully studied and diligently watched in the whole of its practical performance. It belongs in most of its departments more especially to the Farmer's wife and daughters, who should pride themselves in its cleanly, tasteful, prudent and scientific management.

CHAPTER VII.

FARM HORSES.

On this subject I shall confine myself to extracts, principally from Youatt, on the training and feeding of horses. The latter topic is especially worthy of attention, as our methods of feeding differ materially from those in Britain, and may very possibly admit of improvement.

1. "*The process of training* horses for the saddle often requires considerable skill in the teacher. For those intended for the plough, it is very simple; but for both, the best means are gentleness and patience. The horse is an animal possessed of great intelligence. He is capable of strong attachment, and of equally strong resentment. If treated with kindness, he becomes docile; but severity generally fails of its object, and renders him intractable. There is certainly much difference in the natural temper of colts, some requiring more care and time to reduce them to obedience than others; but even the most restive may be rendered manageable by kind and gentle usage."

"From the moment of its being weaned, the foal should be accustomed to the halter, and wisped over and occasionally tied up; but this should be done by the person who feeds it, and never entrusted to lads, who will probably worry the animal, and teach it dangerous tricks; nor to any hasty, ill-tempered man, who would be likely to ill-treat it. The colt will thus early become accustomed to be handled, and will consequently occasion much less trouble than if it had been previously neglected."

After the colt has been a day or two in the stable, a bridle should be put on, but with a small bit at first, instead of the large one usually employed by horse-breakers, and which, by the horse's champing on it with impatience, sometimes occasions the mouth to become callous. He should then be led about, and accustomed to obey the rein in turning and stopping, which he will very soon learn to do."

After a few days he should be completely harnessed, and put into a team with some steady horses. At first he should neither be whipped nor forced to draw, but left quietly to walk with the other horses.

In a very short time he will imitate them, and begin to pull. It may then be proper to let some one mount him, even if he should not be intended to be commonly ridden, as it will render him the more docile. This will be best done when he is in the team, as the other horses will prevent him from plunging. No violence should be used, for while he will readily learn everything that he is taught, he will also recollect many things that it might be wished he should forget; thus if he is beaten for starting at any object, he will only start the more on meeting it again, for he will remember the chastisement it occasioned; and if hurt in shoeing, or any other occasion, he will not soon forget the pain it occasioned, nor suffer a repetition of it without impatience."

"The proper period of castration depends on the breed of horse and the purpose for which he is designed. On the colt destined for common agricultural purposes, it should always be performed before he is weaned—perhaps when he is six or eight months old. It is an operation then attended with little danger, provided the weather is not then too hot. If the colt, however, is intended either for heavy or for speedy draught, the operation should be delayed until the animal is a year or a year and a half old, when his fore quarters will be tolerably developed. It should then be performed as speedily as possible, lest he should become too heavy before, and perhaps a little self-willed. May and September are the best months for the performance of this operation."

2. *Food of Farm Horses.*—"To feed economically and yet efficiently, is the great desideratum. It is a well known fact, that two well fed horses will do the work of three, if not four, that are badly kept; hence it will be evident that to keep a small number of horses, and to keep them well, is more advantageous than to have a larger number and feed them so that they are never up to *par*, or capable of doing a hard day's work. There are no doubt many persons who keep their teams expensively for the mere vanity of having them in good condition, while there are others who obtain continuous service from their farm horses under a very different regimen."

"Mr. Reid, in his admirable essay on the "Management of Farm Horses," gives the following analysis of the component parts of different substances used as food for horses. He classifies them under the heads of *azotised* or flesh-formers, and *non-azotised* or fat-formers:—

	Organic matter.	Azotised.	Non-Azotised.
100 lbs. of Oats contain	80	11	69
" Peas,	80	30	50
" Hay,	76	8	68
" Potatoes,	25	2	23
" Barley Meal,	82	14	68
" Turnips,	10	1	9
" Beans,	83	31	52

He also gives the following formulæ as guides for winter feeding. No. 1 is for a moderate sized horse, and No. 2 for a larger animal, per week :—

No. 1.	s.	d.	No. 2.	s.	d.
7 pecks oats, (70 lbs.,)	3	6	7 pecks oats, (70 lbs.,)	3	6
8 " chaff,	1	0	1 " beans, crushed,	1	6
2 " bran,	0	6	8 " chaff,	1	0
120 lbs. hay,	3	0	2 " bran,	0	6
7 " beans,	0	6	140 lbs. hay,	3	6
	8	6		10	0

"In order to reduce still further the expense of horse-keeping, various trials have been made of the nutritive powers of potatoes, Swedish turnips, carrots, and other esculent roots, all of which have been found sufficient for the support of the cattle during moderate work, and when given with plenty of hay. They have even been found to answer the purpose when given with straw only, but in that case the work must have been very light, for horses should have food of a quality proportioned to their work, and if that is considerable, some corn is absolutely necessary. In fact, bulbous and esculent food is, especially when given with bruised corn or barley meal, better adapted for bringing horses intended for sale into condition, than for maintaining them in working order. The quantity of azotised food may indeed be diminished by the aid of roots, and straw may be substituted for hay; but, in every instance, the quality of the food must be in proportion to the required exertion, or the horse will be injured to a degree which the saving effected in his keep will not repay. Theorists adduce instances to the contrary, but every practical farmer knows that hard work can be sustained only by good feeding. This, however, may be carried to excess; and although farmers cannot generally be accused of being too lavish of corn, yet the allowance of hay is often far too profuse. It is indeed a common practice to cram the rack with an unlimited quantity of this fodder, the consequence of which is that gross feeders stand eating all the night, instead of lying down to rest. Their stomachs become unnaturally distended, and many serious disorders are generated that might have been avoided by a more regular and limited allowance. Nor is this the only loss this system causes the farmer; quantities of the fodder are pulled down, trampled under foot, and utterly wasted. The great secret of feeding well is to feed regularly at certain hours, and in certain and sufficient quantities, and not to allow any intermediate eating. A full meal should not be given immediately after a horse has come in from a hard day's work; let him have a little food to take off the edge of his appetite then, and the remainder an hour or two afterwards, when he has rested."

"Of the esculent roots, sliced potatoes and carrots are those most commonly given; and it is a singular fact that though the former contain the greatest proportion of nutritive matter, horses thrive best on the latter. When potatoes are steamed and deprived of their water, they form a tolerably substantial food; but the trouble and expense of steaming them are great objections to giving them in this way, and, when raw, carrots are preferable. Horses are fonder of them; they have a visibly good effect upon their coat; they are found advantageous to the wind; and they correct the binding effect of dry food. But too many given raw are apt to produce evils of other kinds, and horses which have been fed on them for a short time, often become so fond of them as to refuse other food."

"In some parts of the North, the refuse oats, or any other refuse grain, are mixed with wheat chaff or cut hay, and boiled; and of this mess, after it has become cool, almost a pailfull and a half is given to each horse once a day, generally when his work is over. This is a judicious and economical practice, as very light corn is often swallowed whole when given dry. When horses are kept partly upon straw, it is an excellent mode of keeping their bowels in order; but when put to hard work and fed on hay, its constant repetition would perhaps be too relaxing."

"Mr. Spooner, in his Prize Essay on the "Management of Farm Horses," gives, from his personal knowledge, the following estimates of the cost per week of feeding farm horses. From the middle of November to March, when the work is light, they receive:

	s.	*d.*		*s.*	*d.*
Oats, 1½ bushel,	4	6	Oats, 2 bushels,	6	0
Straw, 1¾ cwt., at 2s.,	3	6	Beans, 1½ peck,	2	3
Swedes, 42 lbs.,	0	4	Hay (not clover), 1 cwt.,	4	0
	8	4		* 12	3

"This second allowance is given as the spring work comes gradually on. When barley and turnip sowing are over, and green food becomes abundant, the corn is reduced to—

	s.	*d.*
1 bushel, costing, - - -	3	0
With green food, worth, say, - -	5	0
	8	0

"As the autumn work approaches, the spring feeding is again given."

* The prices attached to these estimates are given, because, though different from prices here, they form an element in the writer's idea of *economy*.

In the summer feeding of horses, three methods are commonly practised in England: "1st, to turn them out on pastures; 2ndly, to feed them on the field or artificial grasses, either cut or grazed; 3dly, to soil them on green food in the stable or yard." In the second method the horses must be tethered, or confined by temporary fences to a small portion of the ground. In the third method, they are constantly kept in the stable and farm-yard. These two last methods have many obvious advantages, and will no doubt become more general here, as arable farming extends, and summer tillage by horse power becomes more constant and general.

"Cooked food is now much used by farmers; and, under proper management, with great advantage. Steamed or boiled potatoes, turnips or carrots, are given; and the two former, and especially turnips, with great success. Boiling is preferable to steaming. About 40 lbs. of turnips is the average allowance for each horse, and this should be given warm, but not hot, and with the admixture of bran, chaff or ground barley, and about a handful of salt. The food must be cooked as it is wanted, for if kept any time it becomes acid and ferments, and in this state is exceedingly injurious."

"Experience has also demonstrated the advantage of crushing and bruising grain, and even grinding it, and cutting or chopping fodder; these processes facilitate digestion, by bringing the nutritious portions of the food more completely in contact with the stomach, and thus enabling them to pass with greater ease into the system, and afford the animal more sustenance, while to the farmer they are a means of effecting a considerable saving—considerable if we only regard the actual amount of hay, straw, &c., which is wasted when these matters are given in their natural state; considerable, if we look at the quantity of undigested grain voided in the excrements of the horse; and still more considerable when we mark the difference in the condition of those horses which are fed on crushed, chopped, and cooked food, and those which get their allowance in its natural and crude state."

CHAPTER VIII.

SHEEP.

1. *The breeds of Sheep* are numerous, and differ from each other in size, hardiness, readiness to fatten, and length and fineness of wool. The following table from Youatt gives a general view of their qualities :—

Synopsis of the different breeds of Sheep in Great Britain.

					Average weight of wool per fleece.	Average weight of Wethers per Quarter.	Years old when killed.
					Lbs.	Lbs.	
Heath,	Large horns,	Black Faces & legs,	Course long wool,		3½	14	4½
Exmoor,	Horned,	White do.	Long wool,		4½	15	2½
Norfolk,	Large horns,	Black do.	Fleece middling length and quality,		2½	18	3
Wilts,	Horned,	White do.	Short and moderately fine wool,		2½	20	3
Dorset,	Small horns,	Do. do.	Fleece middling length and quality,		4	18	3½
Dean Forest & Mendip,	Do.	Do. do.	Fine short wool,		2	14	4½
Dishley,	Polled,	Do. do.	Long wool,		6	22	2
Lincoln,	Do.	Do. do.	Do.		11	25	3
Dishley and Lincoln,	Do.	Do. do.	Do.		6½	28	2
Romney Marsh,	Do.	Do. do.	Do.	good quality,	7	24	2½
Tees-water,	Do.	Do. do.	Do.		10	26	2½
Dartmoor Notts,	Do.	Do. do.	Do.		7	22	2½
South Down,	Do.	Grey do.	Fine short wool,		3	18	2
Carnock Heath,	Do.	Grey faced,	Do.		3	20	3
Ryeland,	Do.	White faces & legs,	Very fine short wool,		2½	14	4½
Shropshire Morf,	Polled & horned,	Speckled do.	Short fine wool,		2	15	4½
Cheviot,	Polled,	White do.	Short wool,		3	16	4½
Improved Cheviot,	Do.	Do. do.	Do.		3½	19	3½
Hardwick,	Do.	Do. do.	Do.		2	10	4½
Shetland,	Do.	Colours various,	Fine cottony wool,		1½	8	5
Merino,	Horned,	White faces & legs,	Short and very superior wool,		3	16	6

Of the above varieties, the following merit a more particular notice :

(1.) *The Heath or Black-faced* are distinguished by their black faces, with, in the pure breed, a lock of white wool in the forehead. They are hardy, with short and firm carcass, and "long, open, coarse and shaggy wool." Extensively reared in the nothern counties of England and Scotland, and would suit well here in exposed situations, and where long coarse wool is desired.

(2.) *The Exmoor*—are shorter wooled and yield finely flavoured mutton. They are especially noted for their power of resisting the injurious effects of damp.

(3.) *The Dishley or New Leicester*—is a large breed, with excellent flesh, and fattening readily. The wool is both long and fine. I am informed that attempts to introduce this fine breed into the eastern part of this Province have not been very successful, as it has proved too delicate in winter.

(4.) *The South-Down.*—These sheep belong originally to the chalky short pastures of the South Downs, in Sussex, and are a valuable and hardy breed. They have been successfully introduced into this Province They are short-wooled, and have more meat in proportion to offal, than any of the other varieties.

(5.) *The Cheviot*—belong to the hilly districts on the borders of England and Scotland, but have been extensively spread over the whole of those countries. They have short wool of fair quality, produce excellent mutton, and are hardy. I am informed by a good authority that they have succeeded admirably in this Province, and are one of the best breeds that have been introduced. Crosses with the South-Down are said not to have been successful, but those with the Leicester have done well, diminishing however the fineness of the wool and the hardiness of the breed, but increasing its weight and tendency to fatten.

(6.) *The Merino*—is a Spanish breed, with very fine and valuable wool, but a slender carcase, with little tendency to fatten. Chiefly on this latter account, this breed has fallen into disrepute in England, but is still much esteemed and cultivated, especially in some of its crosses, in the United States.

2. *Selection and Rearing of Sheep.*—Under this head, I shall give some extracts from Youatt and from the American Patent Office Reports :—

"In selecting sheep, the breeder or grazier should carefully examine the nature of his land, and having attentively weighed its relative degree of fertility, and his various sources for supplying food, he may proceed to purchase that breed which, after mature consideration, he has reason to believe is best calculated for him.

"In the first place, therefore, though he should never suffer himself to be led into needless expense by purchasing fashionable breeds,

he should be scrupulously particular in procuring the best blood of that particular breed on which he may fix.

Secondly, the nature of the land where the sheep are to be purchased should be attentively considered; for with sheep, as with cattle of any breed, when brought from a rich to an inferior soil, they will always decrease in condition and value."

The following is a description of the requisites of a good *Ram*, quoted by Youatt from "Colley on Live Stock."—

"His head should be fine and small; his nostrils wide and expanded; his eyes prominent, and rather bold and daring; his ears thin; his collar full from his breast and shoulders, but tapering gradually all the way to the junction of the neck and head, which should be fine and graceful, being perfectly free from any coarse leather hanging down. The shoulders should be broad and full, which must at the same time join so closely to the collar forward, and chine backward, as not to leave the least hollow in either place. The mutton upon his arm or fore thigh must come quite to the knee; his legs upright, with a clear, fine bone, equally free from superfluous skin and coarse hairy wool, from the knee and hough downwards. The breast broad and well forward, which will keep his fore-legs at a proper wideness from each other. The girth or chest should be full and deep, and instead of a hollow behind the shoulders, that part, by some called the hind-flank, should be quite full; the back and loins broad, flat and straight, from which the ribs must rise with a fine circular arch. The belly should be straight; the quarters long and full, with the mutton quite down to the hough, which should neither stand in nor out; his *twist*, (i. e. the junction of the inside of the thighs) deep, wide and full, which, with the broad breast, will keep his fore-legs open and upright; the whole body covered with a thin pelt; and that with fine, bright, and soft wool." The above description applies more particularly to the Leicester breed. It is less applicable to most others.

"The purchaser should particularly ascertain that the sheep are *sound;* and as an assurance of this, the teeth should be white, the gums red, the breath not fœtid, the eyes lively, the wool firm, and the feet cool."

"The following hints are selected from Smith's Prize Essay on the 'Management of Sheep:' For the production of male animals, no plan is equal to that of breeding in a line. When using rams of the same flock, they they should by no means be put together nearer than the third remove in the same line of blood. Leicesters will improve larger breeds, but if we attempt to enlarge our mountain breeds by such means, the progeny will not prosper on the hilly pastures of their dams, nor will they become profitable on the richer pastures of their sires."

The following extracts from the Patent Office Reports, show the estimation in which sheep of different breeds are held in the Northern States:—

"It may, however, be proper to say, at the outset, that, having generally pursued a course of what may be called *mixed husbandry*, wool-growing has never been a principal business with me, but rather an item in the general account; my flock being a small one, varying from 100 to 200, and rarely exceeding the latter number. It consisted originally of grade Merinos, averaging, perhaps, about half blood.

From this original flock my present is descended, there having been no change, except such as has been effected by what I deemed a judicious course of breeding, with a view to the improvement of the general character of the flock. By keeping this object constantly in view, I flatter myself I have succeeded in making material, though perhaps not rapid, advances. The flock now consists wholly of medium sized sheep, compact and symmetrical in form, perfectly healthy in every respect, and yielding per head an average of about four pounds of fine Merino wool, of good length of staple, uniform in quality, not overcharged with yolk, and showing in opening a good crimp and lustre.

During the first years of my experience in sheep-breeding, I made use of Saxony bucks in my flock, mostly of pure blood; but, after thorough trial, became fully convinced that, although I was producing a more valuable article of *wool*, I was not in fact increasing the real value of the flock; the improvement in the *quality* of the fleece being attended with a proportionate diminution of the *quantity*, so that, while I was enabled to obtain an advanced price per pound for a given number of fleeces, the aggregate value had in reality decreased, in consequence of the decrease in weight; I also found the animals to be less hardy—less able to withstand the great changes of our variable climate, and, consequently, much more subject to disease. A change, therefore, seemed to be necessary. This was sought to be effected by the introduction of the pure Merino blood, as distinguished from the Saxony, and for the last ten years I have used bucks of that description, to the exclusion of all others, and have reason to be well satisfied with the change.

With the Saxony sheep, the annual average loss from disease and other causes amounted to nearly ten per cent. Since the change made in the course of breeding, the average annual loss does not exceed *two* per cent., and that arising mostly from accidental causes. I have thus become convinced that, in this locality, (it being on a range of land in latitude 43°,) the Spanish or French Merino sheep is to be preferred to the Saxony, if wool-growing is expected to be made profitable. The principal benefits I have found to result from the change are the following:—

1. An increase of the average weight of fleece from about 2½ to nearly 4 pounds.

2. Getting a close and compact fleece, comparatively impervious

to the weather, and thus furnishing a more perfect protection to the body of the sheep from wet and cold.

3. Consequently a more firm and vigorous constitution.

4. And in consequence of the preceding, better breeders, and greater success in rearing the lambs.

The only offset to these advantages that I have yet perceived is a slight sacrifice in the *quality* of the wool.

Much discussion has been had to show which was the most profitable, whether Saxony, a cross of Merino and Saxony, Merino, or large-framed, coarse-wooled sheep, whose carcases are suitable for mutton. The success attendant upon the growth of each kind appears to have depended upon the skill and management of the grower, and the facilities enjoyed for the sale of the wool or carcass.

Those residing near cities or large villages, or possessing easy facilities for reaching these places, may find large-framed, coarse-wooled sheep, to a *limited* extent, profitable; but such is not the fact in regard to the great mass of wool growers in the United States. The profits arising from their flocks must result from the wool, or from the sale of sheep made valuable, by the skill of the breeder, for their superior fleece.

Where the facilities for selling have been such that the intrinsic value of the fleece could be obtained, I think I am not hazarding too much by saying, that the profits arising from the growth of fine wool have been greater than on the lower grades. But where these facilities for selling have not been enjoyed, the profits have been in favour of the grower of medium and low qualities. As a proof of this, reference may be had to the fine wool grower in those sections of the country where, by reason of their superior clips and large flocks, great inducements were held out to fine wool purchasers to visit them for the purpose of buying; and thus a competition was created, which resulted in fair prices; while in other sections, where equally as fine wool was produced, but in less quantities, or where the low, medium, and high grades were grown promiscuously, those producing the fine qualities have been under the necessity of selling their fine wool at 2, or 3, or at most 5 cents only, above the price paid for the common or low grades, and that, too, when the superior condition of the fine fleece alone, independent of its quality, would make that difference: thus sustaining a loss of all their skill, care and expense, in breeding fine instead of common or medium wools."

3. The following extracts will be of service in showing the methods considered best for managing sheep by wool-producers in the United States, and the value attached to different sorts of wool by manufacturers there.

"The condition of the animal should be unifo... from the time of one shearing until the next. If this is not the case, the effect upon the

wool will be injurious; for while the sheep is fattening the wool will be of a grosser growth and the fibre larger; and when it has become poor, the growth will be less vigorous and the fibre smaller; and you have this result, (which will readily be discovered by a practical eye in examining the fleece)—two qualities of wool in the same fibre. I have seen flocks which were well kept for six months after shearing, and then run down in flesh, and remained poor until next shearing, when the outer end of the staple was one full quality in fineness below the inner end; also when the animal had been well kept at the beginning and end of the year, but poorly kept and run down in winter, the middle of the fibre showed the same difference."

"This not only reduces the quality of the wool in the stapler's scale, to the lowest and coarsest grade in the fibre, but also makes the fibre weak and tender in the fine part grown when the animal was poor. The result of bad keeping, also, often injures the health of the sheep, which, in addition to the evils spoken of, gives the wool a knotty appearance and a tightness of the fleece. When the condition of the sheep is good, and they continue vigorous and healthy during the whole year, the fibre of the fleece will be free and uniform in quality, and the fleece heavier and more valuable, than when they are alternately changing from a high to a low state of flesh. *The fineness of the fibre should be produced by the high blood of the sheep, and not by poor keeping.*"

"Before turning out to pasture in the spring, the sheep should be well tagged, care being taken to remove all the locks of wool that would be likely to retain filth. Very early washing often proves injurious; and especially is this true in regard to fine-wooled sheep. It should be delayed until the warm weather has fully commenced, which is usually not until June, when the water becomes sufficiently warm to facilitate the removal of the filth from the wool. Too early washing and shearing often expose the sheep to cold storms and the chilly effects of cold nights, without the necessary covering provided by nature for them; while too late shearing exposes them to the rays of the hot burning sun before the new growth of wool has attained a sufficient length to shield them from its effects.

The manner of washing sheep must necessarily vary, for all have not equal facilities. Pools of stagnant water should be avoided. Better not wash at all than have your flocks poorly washed; for if not washed, you arrive at the value of the fleece, compared with clean wool, by a well known and established rule of discount. The best mode is to use a running stream, or vat with a stream of water, having a fall of a few feet, running into it.

Just previous to washing, the sheep should be thoroughly wet without squeezing the wool, and suffered to stand crowded together for a few hours, until the soapy substance and oil or gum, which the wool contains, unite; when again taken into the water and the wool

squeezed with the hands, the whole of the filth readily separates from the wool, and passes off with the running stream. In the common mode of washing, the soapy substance first passes out of the wool, only partially uniting with the oil and gum, after which it is impossible to remove the gum, no matter how much time may be spent in washing. Care should be taken to wash the fleece thoroughly in all its parts. I have seen frauds attempted to be perpetrated by washing the back and sides, and leaving the belly and skirts unwashed, which in rolling up the fleece were carefully concealed. After washing, the sheep should be suffered to run in a clean greensward pasture a sufficient length of time for the wool to get dry, which is usually in four or five days, and then shearing should commence. Very large flocks should be divided, and the washing done at different times, or they will run too long before being shorn. The place assigned to the flock when collected for shearing, should be well littered with straw and kept clean, so as to prevent the filth, consequent upon their being close together, from getting upon the wool. In shearing, great care should be taken to keep the fleece whole. Each clip of the shears should sever a part of the wool from the sheep, and a second clip either on that part of the animal, or on the part of the fleece just severed, should be avoided; for clippings thus made are useless, and a total loss.

After shearing, the fleece should be removed to a table, or clean smooth place on the floor, with the inner part down; then gathered up into as compact a condition as it occupied when on the sheep; the sides of the fleece should be then folded over so as to meet on the back of the fleece, the head and neck thrown back so as to make the fold upon the sh alder; it is next folded or rolled from the butt of the fleece, and continued until you reach the shoulder. The fleece should then be snugly tied with a small, smooth twine, passing around two, or at most three times. You thus have a compact fleece, easy to open, and the shoulder, which is the finest part, on the outside. Buyers always expect to see the *best side out*, and wool-growers sometimes do themselves injustice by not thus exhibiting their fleeces. I do not believe that the manufacturers, as a whole, in this country, are yet prepared to pay a sufficient advance beyond the present prices, to justify the growers of wool in removing all of the fribs, belly locks and skirts from the fleece, as is done with the fine wools of Germany. I would therefore at present put inside of the fleece all the well washed and clean wool shorn from the sheep, carefully excluding all such locks as are filthy, or below the residue of the fleece in condition.

The various sorts are known by the following designations: Super, Extra, Prime, No. 1, No. 2, No. 3, De Laine No. 3, No. 4, De Laine No. 4, No. 5, and long combing.

There are few flocks, however carefully bred, which will not em-

brace three or four of the above-mentioned classes—many six or even eight of them. Hence the wool grower under the old system, when disposing of his wool to a manufacturer using the lower grades, must expect that such a price only will be offered for his whole clip as the lower grades are worth; and the fine wool manufacturer will not become a purchaser unless a large proportion of the clip is of a quality suited to his purpose. It will readily be seen that these difficulties may be obviated by a judicious classification of the fleeces. The following statement will show the usual relative value of the different sorts, and the uses, in part, to which they are applied. The prices here mentioned for the finer qualities are taken from the highest range of the present year. For the lower qualities there has been an unusual demand, and prices have ranged higher. No. 5, which is the coarsest grade, and used for making coarse satinets, baizes, and the coarser kinds of heavy goods, 25 cents; No. 4, used for low flannels, satinets, and ¾ cloths, 28 cents; No. 4 De Laine, used for a medium kind of worsted goods, 29 cents; No. 3, used for flannels, medium cassimeres and satinets, and low-priced broad cloths, 31 cents; No. 3 De Laine, used for Mousselin De Laines, and other combing purposes, 32 cents; No. 2, adapted to fine fancy cassimeres and medium broadcloths, 35 cents; No. 1, used for similar purposes, 39 cents; Prime, 44 cents; E. tra, 50 cents; Super, 60 cents; another quality may be selected from the Super, called Super-super, worth 75 cents. These high grades are used for the finer qualities of cassimeres and broadcloths. The difference between Nos. 3 and 4, and the De Laines or combing qualities of the same Nos., consists in length and strength of staples, and not in the fineness of the fibre."

The general management of sheep, in relation to food, shelter, attendance, shearing, &c., is a subject so complicated, and depends so much on climate, the breed of sheep, and the purposes for which the flocks are reared, that it would be hopeless to attempt giving a connected summary of it. I may remark, however, that the position and physical character of our province lead to two very distinct kinds of sheep husbandry.

Along the southern or Atlantic coast of Nova Scotia, and in the numerous small islands in its vicinity, sheep may be kept with very little expense and trouble. In Brier Island, for instance, at the southern entrance of the Bay of Fundy, which is inhabited chiefly by fishermen, and has scarcely an acre of ploughed land on its surface, though it can boast of the neat and thriving little town of Westport, large flocks of sheep are kept. They run wild all the year, and in summer find plentiful pasture on the uninclosed surface of the Island. In winter they derive much of their subsistence from sea weed; and even in summer may often be seen scrambling along the rocky shores in search of it. They receive scarcely any attention, except at shear-

ing time, or when required for killing. They are of course small and hardy animals, but their mutton is said to be excellent. Large portions of the southern coast of our province would support sheep in the same manner; and I have no doubt that ultimately almost the whole of these rocky coast districts will be turned into sheep farms, and that the bogs and swamps will be made to yield hay for their winter keep. There can be no doubt that in the comparatively mild climate of these districts, a fine and valuable quality of wool might be produced, suitable for exportation or for the domestic manufacture of the better class of cloths.

In the inland or more properly agricultural districts of the province, fine and large breeds of sheep may be raised, but their winter keep will be more expensive than in the shore districts, and more difficulty will be experienced in providing them with extensive and unobstructed ranges of pasturage. In these districts, as yet, sheep husbandry is generally limited to comparatively small flocks, producing mutton and wool for domestic use only; and the latter in sufficient quantity to furnish the greater part of the outer clothing of the agricultural districts, of better and more durable material than the imported cloths. It should, however, now form a subject of consideration with farmers, whether the production of fine wool for the manufacture of the finer fabrics in this country, or for exportation to the United States or Great Britain, might not be deserving of their attention.

CHAPTER IX.

SWINE.

Perhaps no kind of live stock is more profitable, in proportion to its cost, and the labour required, than swine; and it is equally important in this as in other kinds of domestic animals, to have good breeds to operate on. The following are said to be the characteristics of a good hog:—

"Small muzzle; narrow forehead; large cheeks; eye quick and bright; ears short and thin; neck almost as broad as chine, and that of equal breadth nearly to the tail; belly almost touching the ground from the hind legs to the fore; thighs large both inward and outward, and division between them large; legs small and short; feet firm and sound; bones small; joints fine; hair long and thin; few bristles; skin loose and mellow."

1. There are numerous varieties of the Hog, which are continually increasing by crossing. Probably the most important breds are the Chinese and Berkshire, which are thus described:—

"*The Chinese Breed* is small, fine limbed, round in the carcass, thinly bristled, and thin skinned. There are two varieties, the white and black; the former being better shaped than the latter, but more tender and less prolific. Both breeds are tender, susceptible of cold, and difficult to rear; yet, from their early aptitude to fatten, they are in great esteem with those who rear only young porkers. If fed on farinaceous food their flesh is very delicate, but it becomes coarse and oily when offal and animal substances are given; it is not adapted for bacon, and is deficient in lean meat; and their hind quarters being small in proportion to the body, they cut up to disadvantage when intended for hams."

The great merits of this breed, are its compact form and the readiness with which it fattens on a comparatively small quantity of food. On these accounts the Chinese breed is very useful for crossing with our larger and more slender native breeds, to which it communicates in a greater or less degree its round form and tendency to fatten; though it also gives a more delicate constitution and a diminution of number in the farrows.

The Berkshire Breed is esteemed the best English variety of the hog, the only other sort which equals it in the opinion of the best

authorities, being the improved Essex breed, which appears itself to be descended from the Berkshire, and resembles it in many of its qualities. The Berkshire hog is thus described by Youatt :—

"Sandy or white colour, with brown or black spots; sides broad; body thick, close, and well formed; legs short; head well placed; ears large and sometimes pendant over the eyes. Another distinctive mark of this breed is that the best of them are without bristles, and the hair long and curly, and curiously feathered about the ears. The skin is thin, the flesh well flavoured, and the bacon superior. Hogs of this breed have been known to reach the weight of 113 stones of 8 lbs."

"*Lord Western's Essex Breed* are apparently descended from the Berkshire stock, and may be reckoned among the finest breeds in the country. They are black and white, short haired, fine skinned, with smaller heads and ears than the Berkshire; broad and deep in the belly, full in the hind quarters, and light in the bone and offal. The sows are good breeders, and have litters of from 8 to 12, but they have the character of being bad nurses. Lord Western describes them as feeding remarkably quick, growing fast, and being of an excellent quality of meat."

Youatt thus sums up the comparative value of the best breeds :—

"Each of the breeds we have mentioned has its advocates; but as their respective value does not depend on soil or situations, those differences of opinion can only be ascribed to want of sufficient comparative experiments, or to prejudice. A very competent, and apparently a very candid judge of the merits of the principal kinds, gives it as his decided opinion, that the Berkshire, rough-haired, feather-eared, curled pigs, are superior in form and flesh to all others."

"His opinion of the relative merits of Chinese and Berkshire pigs must have been based on fair experiments, and due consideration of their respective values; for he mentions having fattened a Chinese sow to the weight of forty stones of 14 lbs., at three and a half years old; and the quality of the bacon of each kind fattened and cured, was decided by a party of gentlemen at Lord Conyngham's table, in favor of the Berkshire. In this we unhesitatingly coincide; but we are inclined to think that the improved Essex breed may fairly compete with either, for it can be brought earlier to maturity by three or four months—it makes finer and more delicate pork, especially for pickling—good bacon and hams, and the sows are good breeders."

2. *The Feeding of Hogs* necessarily varies in different countries. The following account of the most approved English practice cannot, however, fail to afford useful hints.

"With regard to sows in pig, it is obvious that they should be well fed, that they may be enabled to supply their young ones with the necessary quantity of milk; but while care is thus taken to keep them

in good condition, equal caution is necessary that they do not become too fat. For those that litter in spring, tares and cabbages, with the butter-milk and wash of the house and dairy, may be employed with advantage; or if the supply from the dairy is not adequate to the demand, a wash may be prepared with oat, barley or pea meal. For those that litter in the autumn, lettuces have been found wholesome and nutritive, in addition to the wash; and in the winter season, potatoes, Swedish turnips, parsnips and other roots, previously prepared by boiling, should be added."

The *Young Pigs*, after being weaned, may be fed in the same manner as the sows; but the addition of pea soup, made by boiling a bushel and a half of peas in about sixty gallons of water, until they are thoroughly broken and dissolved, either given alone or mixed with butter-milk or whey, will very materially improve their condition. No species of food has been found more fattening than barley meal, especially when mixed with skimmed milk. It is also an excellent addition to steamed potatoes. Whatever may be the food, young pigs should be kept warm, for they will never grow or thrive well when exposed to cold. During the weaning, especial care should be taken to supply them with plenty of clean straw, and to keep the pigs as clean as possible. The want of this cannot be compensated by the most plentiful allowance of food."

In summer the *Store Pigs* may be allowed to pasture in a well enclosed field, or may be fed with green food brought to them. The latter is better where the labour can be spared. In the former case "it will be proper to have them *well ringed*, in order to prevent them from breaking into grain fields; and that operation should be performed as early as possible. Mr. Tubb recommends, instead of ringing, the paring off with a razor or sharp knife the gristles on the tips of the noses of the young pigs. The wound soon heals over, and they are thus rendered incapable of rooting in the fields."

For *Pork*, pigs are usually *fattened* from six to nine months old; for *Bacon* from nine months to a year and a half; and store swine at the same period or rarely beyond two years; the latter, however, is the preferable age for substantial bacon for farmers use, and for which purpose the bacon should be made perfectly fat. For porkers, butter-milk, whey and barley-meal are preferable; for bacon hogs, equal parts of fresh pollard and pea meal have been recommended. Generally speaking, a hog in good condition, when put up and intended to be fattened to twenty score, will consume six or seven Winchester bushels of peas. They are generally given raw; but some experiments tend to show that they might be more advantageously used when boiled to the consistence of thick soup."

"Indian corn ground, barley, oat and pea meal, Swedes, parsnips, mangel wurtzel, carrots, flax seed, green clover and green corn, and cabbages, are some of the best and most nutritive matters that can be

used in fattening swine." Roots and vegetables are more useful when cooked than raw, but pigs cannot be fully fattened on these alone. The best and firmest bacon can be made only by the use of grain and pulse for at least a considerable part of the food."

"Swine when fattening should be kept warm and clean, especially in cold and damp weather, and they should also be supplied with plenty of litter, the cost of which will be amply repaid by the increased proportion of excellent dung thereby obtained. They should also be supplied with abundance of water."

"Not only should these animals be kept warm and dry when fattening, but they should also be confined if possible by themselves; or at all events there should be as small a number in the same sty, and as much out of the hearing of the cry or grunt of other pigs, as practicable."

"A practice has been introduced in the county of Essex, though not yet generally followed, of fattening pigs in separate stalls. These are so constructed as to admit of only one pig each, and just allowing him room for him to lie down, but not to turn. They are built with the floor in a sloping direction, to carry off the filth. The food given is usually barley and pea-meal, and water or whey, and they are said to fatten far better in these sties than in the common ones; this is attributed to their being more quiet, and having only to eat and sleep. Instances have been known in which a hog half fat when put into one of these cages, has gained fifteen pounds a week in flesh."

"Regularity in feeding should likewise be especially regarded, as it has great influence in facilitating or retarding the fattening of swine: hence it will be proper to give them a full allowance of food three or four times, or at certain other stated intervals in the day, as convenience or other circumstances may allow. If any animal should have surfeited itself by eating too large a proportion of food, it will be advisable to administer half an ounce of sulphur in some wash, once or twice in the course of the day, and on two or three successive days."

"In *buying and selling swine*, both in a fat and lean state, it has been calculated that every twenty pounds of live weight will, when killed, produce from twelve to fourteen, the advantage being in favor of large hogs; so that if a farmer or breeder weighs the animals when alive, he will be enabled to calculate the net profitable weight when dead. By weighing the hogs every week, he may also judge of the best time for selling them to advantage; for as soon as an animal ceases to acquire that daily increase which makes it beneficial to feed him, the best step that can be taken is to sell or slaughter him, without further delay."

It may be interesting to farmers to know something of the methods by which the immense quantities of pork annually exported from the Western States are produced. I therefore give the following extracts

from the last Washington Patent Office Report. The two first extracts refer to the State of New York; the others to Ohio and Indiana, the head-quarters of cheap Western pork.

"I still hold to the Berkshire as the best; the cheapest are those produced from the dairy refuse, finished off with the soft corn."

"With us along the Hudson River, who cannot compete with the West in producing heavy pork, where grain is cheap, there is a preference for a breed of hogs that mature young. Our cheapest method of making pork is by feeding sour milk, apples, roots, bran, &c.; pork made by feeding grain is less profitable."

"We can boast of being able to produce pork as cheap as can be done almost anywhere. The grazer, from his disposition to fatten at any age, has the preference. The cheapest method of producing pork is to graze all hogs, six months old and upward, from May till July, on clover, without grain of any kind; then put them on rye six weeks or two months; after which they will require but little feeding till ready for market. Spring pigs are frequently put into heavy market; but this needs closer attention and more grain, as it requires also a plentiful supply of rich swill all the time. Older hogs thrive better, and yield a better profit from fall feeding, if grazed in summer."

"Best breeds—Bedford, China, Byfield, Russia, and Sussex; all have their admirers. The cheapest method of making pork is to give the pig the run of clover and stubble fields, and of the fruit orchard that abounds in the best sweet apples, peaches, etc., until he has nearly attained his growth; then put him up in a close pen, and feed on corn meal. If cooked or fermented, all the better. Pork for bacon should be well rubbed all over with salt, and packed in bulk; coarse salt is best; a small portion of saltpetre should be added. After lying two weeks, should be overhauled, again rubbed with salt, and repacked. At the expiration of five weeks after first packing, provided the pork is not large, wash clean, hang up, and, before the surface is quite dry, completely saturate the whole volume of air in the smoke-house, with quick-lime. This may be done by violently stirring or throwing very fine dry lime in the smoke-house. This will effectually prevent injury from skippers, bugs, etc. Smoke well with sound hickory wood. Let your bacon hang as long as you please."

"In regard to the question—how many pounds of meat one hundred pounds of corn will make—it has been well tested that twenty-five bushels of corn will, with three months' pasture of clover, make two hundred and fifty pounds of pork."

"Where labor is so scarce as often not to be had for love or money, the following is believed to be the cheapest method of making pork, and is generally adopted:—

Pigs that come through the season are fed through the winter on corn in the ear, and, about the first of May, are turned on clover. If rye and oats are raised for them they are turned into a rye field when

the grain is in the dough state. From thence they go on oats, and, if the corn be ripe enough, they go into a corn field when the oats are done; if not, they are fed with old corn, or turned again on clover. Those who do not raise rye and oats, allow their hogs to remain on the clover till new corn comes in, unless they have old corn to begin to feed with a few weeks earlier. If corn be gathered and fed to hogs, they should always be fed on a clover-field designed for corn next year, and the manure and clover turned under soon after the hogs are taken off. Thus the crop of corn taken from one field may be made to reproduce itself the next year on another. This is believed to be the cheapest mode of raising pork. It requires less labor, and is less exhausting to the soil; nothing being taken from it but the live weight of the hogs driven to market.

The following is quite a curiosity in its way, as an illustration of the rough and wasteful modes of feeding practised in the West:—

"In this county, where land and corn are cheap, and labor high, as cheap a mode of producing pork as could be pursued, would be as follows: Have your pigs come in April, or as soon thereafter as possible. Let the sows have the range of the clover field, and corn enough to keep them in condition while suckling. Feed the weaned pigs on some corn to keep them growing; young pigs do not thrive well on clover alone; they must be wintered, too, on corn. The next season, if they have been kept thriving through the winter, they will continue to do so during spring on clover alone. Take them off before it goes to seed, else they will slobber. Have a field of ripe oats or rye for them to run on when called off the clover; it should keep them a month, by which time corn will be in roasting-ear; cut up and feed them what they will eat; they will eat the ear and much of the stalk, and the balance they will chew, so as to extract its juice; as much is realized from corn at this as at any subsequent time. When corn is hard in September, have a field to turn them on. In dry weather the waste will not pay for the gathering, and of this your stock hogs, turned in afterward, will save much. In wet weather the plan cannot be followed; that which is trampled in the ground will spoil. The corn must, therefore, be gathered and fed while the ground remains soft. This, however, is not generally done; once turned on, they are suffered to remain. When the hogs have gathered the fields, they should be penned near running water, and fed what corn they will eat. They will come into an early market, weighing 250 pounds and upwards."

The secret of the immense production of Western pork, seems to be the cheapness of Indian corn, occasioned by its easy cultivation and the distance from markets. If, as some of these writers seem to say, green corn, in the roasting state, is as valuable to hogs as when ripe, corn might be profitably cultivated as food for fattening hogs, even in those parts of this Province where its ripening is very uncertain.

8. The following hints on *pig sties* and *troughs* are from Stephens:—

"Piggeries or pig sties are of three kinds: 1. Those for a brood sow, with a litter of young pigs. This kind should have two apartments—one for the sow and litter to sleep in, covered with a roof, and entered by an opening; the other an open court, in which the feeding trough is placed. For a breeding-sty, each apartment should not be less than six feet square. 2. Those for feeding pigs. These should also have two apartments—one with litter for sleeping in, covered with a roof, and entered by an opening; the other an open court, with troughs for food. A sty of four feet square in each apartment will accommodate two feeding-pigs of 20 stones each. These sties may each have a roof of its own, or a number of them may have a roof in common. The latter is the more convenient form for cleaning out and inspecting the internal condition of the sties and the state of the pigs. 3. The third kind of sty is for the accommodation of young pigs, when they are confined, to receive better treatment than the older ones. It should have a shed, and court of from 20 to 25 feet square."

"As swine have very powerful necks, and are apt to push open doors of common construction, the sty should have a heavy door, sliding up and down in grooves. This may be so secured as to elude the ingenuity of the most cunning old brood sow to discover a mode of escape."

Stephens describes a very ingenious iron feeding trough, manufactured by the Shotts iron company, Scotland. It may easily be imitated in wood; and indeed Stephens mentions that the original construction of these troughs was in that material. It consists of a trough of the ordinary form, placed in an opening in the wall of the sty, and divided by partitions, with as many stalls as there are pigs to be fed. Over the front edge of the trough is a swinging door, hinged at top, and secured by a bolt. This prevents the escape of the pigs; and when the troughs are to be filled, the bolt is drawn and the swinging door is pushed back till it is opposite the inner edge of the trough, where it can also be secured by the bolt. The feeder can thus clean and replenish the troughs without interruption from the pigs; and when finished, by drawing back the door to its original place, the animals at once have access to their food. A figure of this kind of trough will be found in Stephen's Farmer's Guide.

4. *The curing of pork* is not in this country usually managed by the farmer, but generally by the merchant, who purchases and cures on a large scale. The manufacture of *bacon*, and other more carefully cured kinds of pork for family use as well as exportation, merits, however, much more attention than it has hitherto received. For this reason, the following selections, shewing the most approved English practice, are introduced here:

"In Yorkshire, the following is the practice adopted: After the pig has been killed, it is hung up for four and twenty hours; it is then cut up, and a mixture, composed of about a pound of saltpetre and two stones of common salt well rubbed into the flitches and hams, which are then laid in a pickling tub. Here they remain a fortnight, and are then turned, and about half a stone more salt well rubbed in. They are again left for another fortnight, after the expiration of which time they are taken out and hung up in the kitchen to dry, a process which takes about two months. When dry, the inner side is washed over with quick lime to preserve the meat from being injured by the fly, and they are stored up for use in a dry, cool chamber."

"Westmoreland hams are prepared in the following way: First they were thoroughly rubbed, usually with Bay salt alone; after which they were, by some curers, covered closely up, while others left them on a stone bench for the purpose of draining off the brine. At the expiration of three or four days this rubbing was repeated, but the salt was mixed with about an ounce of saltpetre to each ham. They were next suffered to lie for about a week either in hogsheads among the brine or on stone benches, after which they were hung up in the chimney to dry. In this last part of the process there is a difference in practice. By some they are suspended so that they will be dried solely by the heat arising from the fire, and without being exposed to the smoke, whether this arises from coals or peat. If not previously sold, they are suffered to continue there until the weather becomes warm, when they are packed in straw or oat chaff, and sent to their respective places of sale."

"In Spain and Portugal, where the hams are remarkably fine-flavored, a large quantity of sugar is used with the saltpetre in curing them. This materially assists in the preservation of the flesh, and renders it peculiarly mellow."

CHAPTER X.

POULTRY.

1. *The Domestic Fowl.*

The most important and useful kinds of domestic fowls are the following:—

(1.) The *Common or Barn-door Fowl*, which is too well known to require description. "When fowls of the common kind are white, they are said to be less healthy than the others, and the hens are seldom good layers. White chickons should therefore be fattened for the table, particularly as the colour of their skin is much better than that of the darker kinds, and their flesh more delicate. The legs of the common fowls should be short, white and shining, and their bodies round and plump." A very fine variety of the common fowl is the "Bolton grey," known in some parts of the United States as the "Creole fowl." They are small sized, short in the leg, and plump in the make. The colour is pure white in the cappel of the neck; the body white, thickly spotted with bright black, sometimes running into a grizzle, with one or more black bars at the extremity of the tail; they are chiefly esteemed as very constant layers, though their color would mark them as good table food." I have seen specimens of this fowl in the possession of Mr. A. Downs, Halifax, who confirms the above statement as to their great excellence as layers.

(2.) *The Game Fowl.*—"The plumage of game fowls is rich and beautiful, particularly the red; and though their size is somewhat less than that of the common fowl, the symmetry and delicacy of their limbs may be compared with those of the race horse or deer. Their flesh is beautifully white, and superior to that of all other kinds of fowl for richness and flavor; but their propensity to fight is so strong, even when chickens, that they often injure or even kill one another, and hence it is difficult to raise them in numbers. The eggs are small in size, but, like the flesh, are much esteemed for superior delicacy."

When lately in Halifax, I saw some fine specimens of the game fowls in the possession of Mr. Wills, a veteran poultry fancier, who has paid great attention to this breed. He stated to me that they are

remarkably hardy, and well worthy of attention on this account, as well as the superior flavor of their flesh and eggs. He had also found that the common fowl is very much improved by crossing with this variety; a game cock introduced into a flock of any of the common varieties of hens being the means of improving their produce both in quantity and quality. The pugnacious propensities of the game fowls are troublesome in rearing them, but are best treated by allowing the chickens to take their own way until they have finally settled the question of supremacy, when their conflicts cease. Some of the fowls of this breed shown to me by Mr. Wills, were patterns of symmetry of form, and probably nearer to the original perfection of type in the species than any other of the improved varieties. Their weight was from 5 to 6 lbs.

(3.) *The Dorking Fowls* "are distinguished by having five toes instead of four on each foot. Their flesh is extremely white, succulent, and delicate; and they have the advantage of feeding rapidly, and growing to a very large size when properly managed. The most common variety is white, but there are others with spotted, speckled, and bluish-grey plumage. The speckled Dorkings are subject to diseases of the lungs, and sometimes pine away without any apparent cause, just when they are attaining maturity. The hens are neither good layers nor good mothers, frequently trampling their chickens to death. The experience of Mr. Downs is different, (see a few pages further on.) The writer has found Dorkings, from eggs procured from Mr. D., to be good layers and mothers, hardy, and, he thinks, much preferable to the Shanghai or Spanish breeds. The eggs are large, pure white, very much rounded, and nearly equal in size at each end. This peculiarity in shape is also observable in the eggs of the common white Dorking Fowls." The Dorking is perhaps the most profitable of all the breeds, for rearing for the table. It attains to weights of 8 to 12 lbs.

(4.) *The Malay Fowls* "have remarkably long legs and large bones. Their flesh is however well flavored when properly fattened, and their eggs are large, yellowish, and very rich. These fowls are taller and stronger than most others, and their color is black or dark brown, with yellowish streaks. They are said to be bad sitters, but this is not always the case." The Malay fowls appear to be too tender for this climate.

5. *The Spanish Fowls* "have black plumage, with a greenish metallic lustre—combs large but not brilliant scarlet, and generally droop to one side--a white fleshy substance on the cheek, larger in the male than the female. The Spanish fowls are large and stately birds, excellent for the table, and lay a great number of eggs, which are remarkable for their size and flavor. They are bad sitters, and seldom wish to sit; but if well fed and kept warm, will lay every day for the greater part of the year. They are easily injured by cold,

and the chickens are a long time before they attain their complete plumage. Some varieties of these fowls have double combs, and top knots or tufts of feathers under their chins. Others have the plumage grey, speckled or white, or black with a white spot on the breast.

Some specimens of the most improved breed of the Spanish fowls, have recently been imported by his Excellency from Great Britain, and are superior in size and symmetry of form to the individuals of this variety previously introduced into this Province from the United States.

Mr. Downs has some fowls which he names the *Algerine*, and which appear to be allied to the Spanish. They are remarkable for their excellence as layers, but are of small size. They very early arrive at maturity.

The Spanish fowls are said to attain to the weight of from 8 to 12 lbs.

6. *The Shanghai or Cochin China Fowls.*—The first is the proper name of these birds, the true Cochin China being a smaller and more elegantly shaped fowl. The Shanghai fowls are very large, sometimes weighing fifteen pounds, and clumsy in their form. Their color is ginger brown, sometimes with a blackish mark on the breast. Some varieties, however, are white or black, and a white variety with feathered legs is much esteemed. The flesh of these fowls is very delicate, and the eggs, which are not large, are of a pale chocolate color, and of excellent flavor. Fine specimens of the white Shanghai or Brahma poutra have recently been imported by Mr. Downs.

The Shanghai hen sometimes weighs 10 lbs., and the cock as much as 12 to 14 lbs. The hens have been known to lay five eggs in two days.—*Dickson.*

7. *The Poland Fowls* are elegantly formed birds, with a tufted crest, while the comb is small and in front. There are many varieties in color, some of which are much esteemed by the curious. The Poland fowls are remarkably good for the table, and produce very large finely flavored eggs, but they are bad sitters. *

The above are the principal varieties of useful fowls, deserving of attention on account of their value for the table or as layers. There are, however, many other sorts, as the Lark-crested, the Hamburgh, the Bantam, the Dwarf, the Runikin, the Frizzled, the Silky, the Negro, the Russian, and the Barbary, as well as innumerable intermediate kinds produced by crossing, affording abundant scope to the tastes of fowl-fanciers, and many of them no doubt capable of being profitably reared.

Persons who rear poultry for profit, will not find it desirable to confine themselves to one breed. Crosses between the best imported breeds and the best specimens of the ordinary fowls, as well as among

* Dickson and Moubray, on Poultry.

the imported breeds themselves, will often be found more profitable. It is not generally desirable to attempt crosses between breeds that are very dissimilar in form and qualities; but on the other hand, continual breeding in and in tends to degeneracy. Crosses between the Shanghai and Dorking, and Shanghai and Game, are reputed to have been very successful.

Poultry Yard and Sheds.—The following facts on this subject are extracted from Youatt:—

"Where a considerable number of fowls are kept, a poultry house, however small and simple it may be, should be devoted to their use. In a farm establishment this is particularly necessary, otherwise the owner will suffer materially, as they will often wander away and be killed, and the eggs will be laid in all kinds of places. This building, although well ventilated, should be warm and comfortable, and so contrived as to receive the sun's rays, during the greater part of the day. Few animals suffer more from cold than our domestic fowls. The roosting places should be easy of access to the poultry, but sufficiently high to be out of the reach of vermin, and they should consist of one or more long level ranges. The boxes for laying and sitting should be convenient and warm, apart from each other, and sufficiently numerous. If there is sufficient space, a yard should be fenced in, communicating with the poultry house, and in which the whole stock may occasionally be confined. It should contain a stream or pond or troughs of water, and be divided into compartments, so that the different sorts should not become intermingled. At all events, if the poultry wander about the yard, or the barn door or other parts of the premises during the day, their roosting and laying and sitting places should be comfortable and closed at night, and there they should always be fed. The poultry yard should be dry; there should be sheds for refuge in wet weather; and sand, chalk and lime rubbish should be strewed in it, in which they may roll themselves, and from which they may obtain lime for the shells of their eggs."

In this country a good hen-house may be made by boarding and shingling the outside, ceiling the inside with rough boards, and filling in the space with eel-grass or tan-bark. It should be in a sunny sheltered place, with the door and a window on the south side. To keep the feet of the fowls warm in winter, some persons wrap pieces of carpet round the roosting poles. The new breeds of fowls are more tender than the native ones; and near towns it might pay to warm houses for them by stoves. Some persons who do not go to this expense, carry in every morning in frosty weather a box of warm ashes, to warm the air of the hen-house, and enable the fowls to dust themselves. Any cheap expedient that tends to secure uniform warmth in the hen-house, will be found to promote laying in winter;

but smoke and all noxious vapors and odors, whether arising from fires or animals, should be carefully avoided.

Choice of Poultry.—Youatt says :—

"As soon as it is determined to have a poultry yard, the breed or breeds should be determined on—for some must be chosen as sitters and others in order to supply the nests and the table with eggs : great care should be taken in the selection of the fowls, for on their healthiness success will chiefly depend. The signs of health are as evident and as certain in the feathered biped as in the quadruped. The glossiness and smoothness of the feathers—the brightness of the eye—the cleanness of the nostrils—the florid redness of the comb—the soundness of the legs, and the shortness of the claws, will be sufficient pledges of health. The male should be large of his kind, and bold and active. The hen should be gentle and tame, and by no means above the middle size. A small comb on the hen may be pardoned, but should not be chosen. A large comb is a frequent pledge of her unquietness, and rarely belongs to a good sitter or a careful nurse. Yellow legs are to be avoided, for there is a prejudice against them, and not altogether without cause. They are often connected with a delicate constitution, and with coarse and tasteless flesh. The fowls should be of a middle age, between eighteen months and two years. Before that period the eggs will not have attained their full size, and the young birds will be proportionably small. The first inhabitants of the fowl yard who will give to it its future character, should not be bought from a stranger, but there should be a certainty that the hens are good and early layers, and that they begin to lay again as soon as their brood is disposed of. The best period for commencing the business of the poultry yard, is the latter part of winter or beginning of spring."

Food of Poultry.—"Hens when laying require access to lime, in the forms of chalk, burned oyster shells, marl, broken plaster, or crushed egg shells. They also at all times need small stones or sand to aid the process of digestion."

"Poultry," says Dickson, "are fond of all sorts of grain. They also eat most sorts of green vegetables, such as lettuce, spinach and cabbages, both raw and boiled, but this sort of food should be used only as an adjunct to grain. Most sorts of animal food they are also fond of, both raw and cooked. Insects also, and worms and snails, they search for with avidity; and some will eat slugs, but of these they are not usually fond, and many fowls will not touch them. It is recommended by some works to feed fowls on refuse corn, but this is quite a mistake; as though young fowls may be fed on offal, it is the best economy both for fattening and laying, to give fowls the finest kind of grain. Fowls may be fattened either (1) by having the run of the

farm-yard with occasional feeds; and in this way the finest and most delicate flesh is produced, or (2) by taking them up and confining them in coops for a few weeks before killing; this seldom succeeds well with fowls accustomed to liberty, or (3) by accustoming them to confinement from an early age, and providing them with a roomy and clean feeding house, with plenty of food, water and gravel, and perches for those that choose to perch, as well as straw for those that prefer lying in it to perching."

"When chickens are put up for fattening, it should be as soon as they have quitted the hens, as they are then usually in fine condition and full of flesh, which they lose as their bones develope and become stronger, particularly in those fowls which stand high on the leg. In the choice of full sized fowls for feeding, the short legged and early-hatched always deserve a preference; the best mode of keeping poultry is to let them have constant high keep from the beginning, when they will not only be always ready for the table with very little extra attention, but their flesh will be superior in juciness and flavor to those which are fattened from a low and emaciated state. Pullets which have been hatched in March, if constantly high fed, will lay plentifully through the following autumn, and may be fattened for table in February.

"Instead of giving ordinary or tail corn to my fattening and breeding poultry," says Mowbray, "I have found it most advantageous to allow the heaviest and the best; thus putting the confined fowls on a level with those fed at the barn yard, where they are sure to get their share of the weightiest and finest grain. This high feeding shows itself not only in the size and flesh of the fowls, but in the size, weight, and substantial goodness of their eggs, which in these valuable particulars will be found far superior to those of fowls fed upon ordinary grain or washy potatoes; two eggs of the former going farther in domestic use than three of the latter. The water given to fowls should often be renewed, and kept fresh and clean; indeed fowls that have been well kept will turn with disgust from ordinary food or dirty water."

The following summary of the value and effects of food of different sorts, is selected from Dickson and Moubray:—

Grain of all kinds occupies the first place. Nearly the same measure of oats, buckwheat or barley, will be found sufficient for a fowl per day. A fourth part less of wheat will suffice, and still less of Indian corn or rye. The tastes of fowls, however, differ somewhat, and they will ordinarily consume more and thrive better where they have a choice of food. Most fowls prefer *boiled grain* to that which is dry; and in the case of Indian corn and barley, there is a considerable saving by boiling the food, but this does not appear to be the case with other grains.

Bran and Pollard mixed into a paste with water, are good food; but fowls require about twice as much as they do of dry grain.

Peas and Beans are good food, and as nutritious as grain. They are better boiled than raw.

Potatoes are useful along with grain, but should always be boiled and given to the fowls warm.

Carrots, Turnips, Parsnips, &c., when boiled, may be given as an evening meal when grain has been given in the morning, or they may be cut into small pieces and mixed with bran or oatmeal.

Green food and kitchen scrap may form a considerable part of the subsistence of fowls; crumbs of bread, fragments of puddings, &c., are of course about equal to grain; parings and portions of green vegetables are useful as a variety, but not good as a staple article of diet. Every scrap of meat or fish, and bones with pickings on them, will be found acceptable to poultry, and will promote their laying. Fat is also much relished, but, if given in large quantity, renders them too fat to continue to lay.

Laying and hatching.—"There seem to be naturally two periods of the year when fowls lay—early in spring, and afterwards in summer; indicating that fowls, if left to themselves, would, like several wild birds, produce two broods in a year. In warmer climates, young healthy fowls most usually begin to lay in February, but cold retards the process in colder climates, and the knowledge of this fact has been taken advantage of to anticipate the natural period. Some hens will lay only one egg in three days—some every other day, and others every day. It is told of some ancient varieties, as well as the Cochin China and other modern kinds, that they have been known to lay three eggs in one day."

"The eggs ought to be taken from the nest every afternoon, when no more can be expected to be laid; for, if left in the nest, the heat of the hens, when laying next day, will tend to corrupt them."

"The laying of hens continues, with few interruptions, till the end of summer, when the natural process of moulting puts a stop to it, because all superabundant nutriment is required for the growth of new feathers, and the cold weather which succeeds prolongs this period of rest. Each successive year the period of moulting is later, and consequently, the older the hen is, the later in the spring does she begin to lay."*

"The period of commencing to lay," says Youatt, "may be hastened by a portion of buckwheat, hemp seed or barley, given with the usual food. This object, however, being accomplished, all stimulating food is to be removed; for a laying hen must not be too liberally fed. Too plentiful as well as too little food will almost equally lessen the number of eggs."

The most efficacious way," according to Dickson, "of promoting laying is to *keep the hens warm*, as we know that a severe frost will

* Dickson.

suddenly stop the laying of even the most prolific hens. Another mode is—as pullets commence laying before the older hens, and do not moult the first year—to have an early summer brood hatched in April or May, which will begin to lay about Christmas; in fact, by attending to the period of hatching, hens may be got to lay all the year. A friend informs us that a neighbor of his in this way has a brood of chickens soon after Christmas, which, by being carefully sheltered from cold and wet, and fed once a day on boiled potatoes, hot, begin to lay early in the ensuing winter."

Youatt gives the following directions in reference to sitting hens:—

"Towards the beginning of March many of the hens will show a disposition to sit. Fresh nests should be prepared, composed internally of short and soft materials in a frame of wood, and level with the ground, or, which is better, about three or four inches from the ground, and the ascent to them very gradual. The hen or hens that are intended to sit should be carefully selected. The eggs that are to be placed under the hens should have the date of their being laid marked upon them; and, varying with the size of the hen and of the eggs, a proper number should be selected that were laid within a day or two of each other. A small hen, if the eggs belong to a small breed, will cover from eight to ten eggs; a large hen may manage twelve or fourteen. These should all be marked, and advantage taken of the occasional absence of the hen to see whether any others have been added. If there be more than the proper number, the unmarked ones should be removed. Proper and sufficient food should be placed near the hens, that they may not be too long absent from their charge. Hunger alone will induce them to leave it for a moment."

"No interference should be permitted during the whole of the incubation, unless at the close of it the chicken should not be able to free itself from the glutinous substance that lines the inside of the egg; nor should any of the chickens be taken away as they are hatched, for this will only disturb the hen and the others. She should be left quite alone, till she comes chuckling from her nest with all her little ones about her."

"The proprietor may not wish to have too many broods of chickens running about at the same time. If there is not more than a day or two difference in their age, he can select the last that hatched her chickens, or he can take the most careful and best mother, and give her the whole of the broods. If the other hens are then placed at a distance, they will give over chuckling in the course of a day or two, and begin to lay eggs again."

"The best food for newly hatched chickens is shelled oats boiled for a minute or two; to this may be added a little hard boiled egg or crumbs of bread. The mother will provide them with plenty of insects and other food. Every one who has much to do with poultry should have a brood basket, in which he can carry the hen and her chickens

to different parts of the yard or farm. The wicker-work will allow the chickens to go out, and they will pursue and pick up all the larvæ, insects, and other creatures, destructive to the crop. When one space is cleared, the basket may be moved, until the greater part of the field is gone over. After about a week, the hen may be suffered to run about with her brood. Her health will be improved by this. She will teach them the most suitable kinds of food; and by her habit of scratching she will procure them much that would otherwise be lost."

"For chickens that are intended to be fattened, the grain, during the first week or perhaps longer, should be steeped in water or boiled for a few minutes. The hot liquor may be thickened with oat or barley meal to a firm or almost solid state. Pea meal or boiled potatoes, given warm, and light corn, or almost any food of this kind which is most convenient to the owner, and which does not excite purging, may be substituted. In the course of ten or twelve weeks the chickens will have become sufficiently grown to send to market."

The following practical directions for breeding fowls, are extracted from Bennett's poultry book:—

"When the object in view is to perpetuate distinct varieties of uncontaminated blood, the first requisite is to procure fowls known to be of pure blood, and possessing all the necessary characteristics of their kind. Labor is lost unless the fowl selected is a perfect specimen of his variety, for whatever imperfection exists is likely to be perpetuated in the progeny. Regard should be had to plumage, to size, and to form, in making a selection either of a cock or of a pullet, and those are preferable which are hatched earliest in the year. The age of the fowls is a matter of considerable importance; and though it is true that a fowl will lay the greatest number of eggs in her first year, yet it is believed that the chickens which are hatched from the second year's eggs are more vigorous and healthy. Old hens are preferred to pullets generally as sitters, on account of their more sedate and matronly character. A young cock, though more active in his earliest days, and likely to bestow his attentions on the hens with less reserve, is not, however, best for use in keeping a breed. The eggs impregnated by him after his first year are likely to produce the strongest chickens. It is an error to suppose that his pro-creative power is decayed or vitiated, as is often represented, after three or four years. On the contrary, a healthy, vigorous cock, if not allowed to walk with *too many* hens, may be valuable and useful in the poultry yard for a longer time.

An error is often committed by giving too many hens to one cock, and the result is a weak and otherwise deteriorated progeny. *Not more than five hens* should ever be allowed to associate with a single cock where the quality of a breed is a matter of interest. Three

would be the better limit of restriction, but five is the furthest limit which can be safely assigned."

"Most persons in obtaining a single vigorous cock and hen of a desirable variety, find their anticipations more than realized in the production of a fine progeny. The plumage is brilliant, and the chickens are of increased size and remarkably strong and healthy. This happy state of things continues so long as the cock is restricted to a small number of hens. So soon, however, as his harem is enlarged, different effects are manifested, and a deterioration in the stock is clearly observable. This is not to be attributed to close breeding, but to the increased disproportion of females to the males."

I am indebted, for the following additional hints, to Mr. A. Downs, of Halifax. They merit special attention, as the results of experience in this province, by a person accustomed to observe in natural history:—

"*The Poultry House* should be in a dry position, with a south aspect, and should be made as warm as possible in winter. It should have a large window to admit the sunlight. It is better to have no floor, as this harbors rats, but it should be swept out once a week and strewed with some litter, which will make good manure. It should be well whitewashed inside and out; this tends to destroy lice or ticks. Hens prefer a darkish place to lay in. Boxes for this purpose should be placed in the floor or against the wall, with a board over them to prevent the fowls from dirtying the nests."

"If the fowls have not the run of the premises, give them as large a yard as you can. They should have grass, pounded oyster shells or old lime, gravel and clean water. They should have access to dry earth to dust themselves. If kept under cover, it will always be sufficiently dry. A yard with rich earth will furnish them plenty of worms. You cannot rear fine chickens unless they get worms. A brood of young chickens in a garden are of as much use as a man, by freeing it of insects. Confine the hen in a coop, and allow the chickens to run around."

"*Food.*—The cheapest in this Province is barley and oats, with grass or vegetables in summer. In winter, they should have, in addition, potatoes or turnips boiled and mashed up with meal or shorts, with occasionally a little animal food. The pot liquor that meat has been boiled in is good to mix their meal and potatos with. Curds and meal are the best food for young chickens. It is well to confine the hen near the kitchen door, and allow the chickens to run about."

Choice of Stock, &c.—Always pick out the best and healthiest fowls to breed from. If this is attended to, I do not think that breeding in and in is detrimental, at least for a long time. Fowls that have been liberally fed, and have a warm house, will lay during the winter. Pullets are the best for this. Fowls two years old are the

best to breed from. They should not be kept after they are four years old, as they do not lay so well. Six or eight hens to one cock will ensure most of the eggs to hatch strong healthy chickens."

"*Kinds of Poultry suited to this Province.—The Grey and Speckled Dorkings* are the best kind of fowl, where you wish to keep but one kind. They lay well, sit well, and make an excellent stock for the farm or market. When full grown, the pullets weigh five pounds and the cock eight. Their meat is fine and juicy; they have large and plump bodies, with a broad, full chest, like the patridge; the pure breed have five toes; they are very hardy, and the young are easily reared, a matter of great importance in this climate. Capons of this breed weigh from 10 to 12 lbs."

"*The Black Spanish* is not surpassed either in utility or beauty by any other of the poultry tribe; the comb and wattles, however, are very apt to get frozen in this climate; they should be kept in in very cold weather. The hens lay very large white eggs; they never want to sit. If you wish to breed them you must employ other hens for that purpose."

"*Cochin China or Shanghai.*—The eggs of these breeds are small for their size, and of a brown color; they frequently wish to sit, but if prevented they will recommence laying; they do not appear to grow so large in this climate as in more southern lattitudes, though they are quite hardy; the flesh is coarse, and they want depth of breast; they make, however, a good cross with almost any other kinn of fowl, and these cross breeds have a better shape, larger eggs, and finer flesh."

"*The Brahma Pootra* is a large white variety, with wings and tail edged with black, feathered legs, and short tails; the form resembles that of the Shanghai, of which this is probably a variety. I have just received four of this breed, and do not know much about their qualities as yet; they are at present the top of the fowl fancy in England, where their eggs have been sold for four guineas a dozen."

"*The Bolton Grey* is a middle sized fowl, with white body spotted with black, which gives them a very pretty appearance; they are good layers, and never want to sit; they stand the climate well. I had some pullets of this breed that laid very early in the fall. The Bolton Greys are profitable fowls where eggs are the object in view; but if you wish to breed them they must be hatched under other hens."

"*The Golden Hamburgh* is a very handsome variety, the cocks of a bright yellowish red, and the hens yellow with black marks; they are smaller than the Bolton Grey, good layers, small eaters, and do not wish to sit."

"*The Algerine* is a breed which I obtained from the captain of a Prussian ship, who obtained them from Algiers. They are black, grey or yellow, and have much of the appearance of Spanish fowls,

though smaller; they have large drooping combs and gills. I have found this breed more profitable than any other; they are hardy, grow rapidly, lay well, and the eggs are large for the size of the birds. They are wild and active, and seldom wish to sit. I was informed that when on board ship they continued to lay constantly—a good evidence of their laying qualities."

2. *The Turkey.*

"There are various breeds of turkeys, the best and most hardy of which is the black Norfolk. The varieties of copper colors never attain to the size of the Norfolks. The white turkeys hav the character, and truly so, of not being sufficiently hardy."

"As soon as the laying season commences, the males may, with advantage, be separated from the females. The hen will perhaps endeavor to build her nest in some inconvenient place, and with improper materials; it will therefore be proper to watch her, and to remedy this. She will generally lay more eggs than she can cover. About a dozen is a proper number for her. Each turkey hen ought to rear at least ten at the first hatching, and about half a dozen at every subsequent time. The period of incubation is twenty-eight days, or sometimes one or two more. Until she has hatched her young ones she is a good mother, and will half starve herself on her nest, therefore she should always have food, water and sand, within her reach."

"The young birds are very tender, and should be left under the care of her mother until the whole hatching is completed. During the first month they require much nursing, and should be protected from the inclemency of the weather. Their food should be nutritious and varied: oat and barley meal, moistened and beaten into a mass, well-boiled eggs, malt, meal, &c. These articles should be alternated or mixed together; the principle is, that there should be a frequent change of food. After the first three weeks the food may be a little more stimulating, and bruised peppercorns should be added, or caraway seeds. The first should be given in preference, and the two will, for general purposes, supersede every other kind of spicy food. The state of the brood should be often inspected, and if any of the young ones are drooping or refuse to feed, or are pen-feathered, a few additional peppercorns may be added, with pills composed of garlic and rice, which must be forced upon them. Small bits of lean meat may also be thrown to them. They may have free access to water, but the food that is given to them should be beaten together into as solid a form as possible."

"When two or three weeks are passed, if the brood is doing well, the food on which they will be afterwards kept may be given in small quantities, as buckwheat and other kinds of grain and vegetables, &c.,

the mixed meals being still continued. They may now wander farther from their coops, by degrees extending their range, until they have become independent of the hen. They will then, perhaps, be rarely seen at home, except perhaps to receive their regular food at morning and evening."

"When the bird is nearly full grown, there will then be little trouble in getting him into good condition, by the use of plain and wholesome food; and the flesh will then possess the best flavor. If there is a necessity for greater haste, or if it is wished to accumulate more fat, the spices already referred to may be given in the food, with the occasional addition of an onion, of which the bird seems to be naturally fond. If there is a decided objection to anything as a frequent or common food, it is to milk, which has a strange tendency to become quickly sour in the pouch of the turkey."

"Marrow fat peas, and most sorts of pulse, are also said to be injurious to the turkey."

"The turkey prefers dry soils, and high and airy roosting places."

"The eggs ought to be taken from the nest every morning as soon as laid, and kept in a basket in a cool, dry place, till the hen leaves off laying, when none of them will be too old to set for hatching. When turkey hens have been left to themselves during laying, and have chosen a nest at a small distance from the house, there is hardly anything to be done, for they will leave it with difficulty, and they generally hatch their brood safely, and the young ones are the stronger for it."

"The timidity of turkey hens when sitting, makes it indispensable that no one approach them, except the person who usually gives them meat and drink. Nothing thwarts and disturbs the hens more than to meddle with their half-hatched eggs."

"The hot sun and the rain are equally injurious to young turkey chicks. They may, however, be exposed to the moderate warmth of the sun for a short time each day. They should not be handled and hand-fed when very young, but are better left to the care of their mother until they naturally begin to peck."

"No food makes the flesh of young turkeys more white and delicate than kitchen stuff." *

8. *The Duck.*

There are several varieties of the tame Duck. The dark coloured Rouen Duck is most in request. The English or Aylesbury white is large, but inferior in flavor. It is usual to have one male to every four or five females. They should be carefully selected, with regard to their being prolific, attentive to their young, little addicted to wan-

* Extracted principally from Youatt and Dickson.

dering, fattening kindly, and their flesh being of good flavour. Different breeds should not be mixed together.

"Some attention should be paid to their nests, for they are apt to be careless in the beginning of their laying. The eggs should be regularly collected and marked with the day on which they were dropped. When there is more than one duck anxious to sit, the eggs should be selected according to the time when they were produced. A brood duck will generally manage about a dozen eggs. They should always have food and water near them, that they may not be taken away too far, or kept too long from their nests."

"The ducklings should remain with the mother a few days or a week, being kept on nearly the same food as the young chickens, with plenty of water in shallow pans or troughs. In a few days the coop under which the mother is confined, may be moved to a sheltered sunny spot, where there is plenty of grass, and shifted every day. In the course of a fortnight the ducklings may be permitted to go with the mother to a pond; but the day should be fine and the weather warm, and they should be suffered to remain out only a little while at first, lest they should be cramped or scoured."

"The practice of raising ducks under hens, is a cruel and unprofitable one. It rarely comes to good."

"In six weeks or two months the owner may think of turning some of the ducklings to profitable account. He increases the morning and evening meal, gives them more grain, or some kind of culinary vegetables. He varies the food continually. This is a golden rule that should never be forgotten. He mixes up the meal or grain with any waste animal fluid. The ducklings are thus kept in a state of unnatural fatness. This is dangerous, but it is necessary, for otherwise they would not attain the condition that is indispensable to their sale, or the peculiar favor in which the epicure delights."

"The fattening of the full-grown duck is another business. He is taken from the corn-field and the pond. He is confined in a somewhat darkened place. His food is immediately placed before him, and under the combined influence of these processes he rapidly gets fat."

4. *The Goose.*

"A mixture of different breeds is far from unusual or improper in the rearing of geese. The large white gander and dark grey goose will suit best. An important object with the breeder of geese, is to have, if possible, two broods in one season. In order to effect this, he feeds his breeding stock well towards the close of the winter months, and particularly as the laying season approaches. He will know when that is at hand, by the goose beginning to carry straw in her mouth. He must immediately provide her with a nest in the hatching house,

or some other convenient place, and she will then begin to lay her eggs. Ten or twelve eggs will be as much as she can manage to cover, and the rest should be removed. Her time of incubation is thirty days, during which she should be fed chiefly on oats, and a little boiled potato rubbed fine given to her every three or four days."

"The goslings should remain with the goose, the entrance of vermin of every kind being prevented, and should be supplied with the kind of food recommended for the ducklings and other young fowls. Fresh water, sand and a clod of grass, or turf, are among the indispensable things. Having become a little strong, and not so liable to be attacked with cramp, etc., which will be the case in a week or less; they may be turned with the goose into a plot of short grass. This may be continued until they are strong enough to be turned out with the other geese."

"The after history of the gosling and goose varies but little from that of the duckling and duck; the same full allowance of food is required, and the same week or fortnight's extra feeding before they are sent to market. Boiled potatoes and oats given warm, will tend to fatten geese into fair condition."

"All men," says Markham, "must understand that except they have pond or stream, they can never keep geese well."

"All damp must be avoided in houses for geese, for they are at all times fond of clean, dry places to sleep in, however much they may like to swim in water."

"It is not good to keep geese with other poultry, for when confined in the poultry-yard they become very pugnacious, and will very much harass the hens and turkeys."

"Grass, the refuse of vegetables, occasional meals of potatoes and grain, with the range of stubble fields in autumn," furnish cheap means of keeping geese in this country, but attention to fattening them by regular and abundant food before killing, would much improve their quality and enable them to realize a higher price. It must be admitted, however, that geese of good quality are usually much more abundant in the markets and Agricultural Exhibitions of this Province than are superior specimens of the other kinds of poultry.

The *Wild Goose* of this Province, or the "Canada Goose," as it is usually named in British books, well deserve attention as a domesticated animal. I have seen it in a tame state in the possession of Mr. A. Downes, of Halifax, and other persons in that vicinity; and also crosses between it and the common goose. It excels the common goose both in elegance of form and in the quality of its flesh. The cross between the common and wild goose is excellent for fattening; but being a mule it will not answer for breeding from.

Nothing has been said in the foregoing pages of the practice of *cramming* fowls, with the view of producing an unnatural fatness,

enlargement of the liver, etc. Unless skilfully conducted, this practice may do more harm than good; and poultry is really in the best condition for the table, as well as most wholesome, when it is in good healthy flesh and fatness, produced by abundant natural feeding accompanied by moderate air and exercise. In this Province poultry is too frequently far below this condition.

CHAPTER XI.

MANURES.

Many facts, that might have been arranged under this head, have been already stated, in treating of soils and crops. I shall, therefore, give here only short notices of the nature and modes of procuring and saving the substances, which have been already noticed, as necessary to form the food of cultivated plants; adding some extracts explanatory of the details of the management of manures.

Organic Manures.

Under this head, I group all those fertilizing substances which have formed parts of animals or plants, and are restored to the soil, whence, or by the aid of which, they were obtained; though some of them cannot, in strict chemical language, be termed organic.

Stable Manures.—Agricola long ago said, "More than one-half of the manure made in the Province, is absolutely wasted, from ignorance and inattention; and the other half is much more unproductive than it would have been under more skilful direction. We have almost no pits, dug upon a regular plan, for the collection and preservation of the dung which, from time to time, is wheeled out of the barn. Sometimes it is spread out on the green sward; sometimes cast carelessly in a court, or adjoining yard; but seldom is an excavation made, purposely for retaining the juices which run from it. These are suffered either to stream along the surface, or sink into the earth; and in either case, their utility is sacrificed to inattention or ignorance. This is no more, however, than half the evil. The exhalations which arise from the ardent influence of the summer's sun, or from the natural activity of fermentation, are permitted to escape freely, and to carry with them all the strength and substance of the putrescible matter." There is, no doubt, much more attention given to this important subject just now; but still, the waste of barn-yard manure, both solid and liquid, is a great evil, and a fruitful cause of agricultural poverty, and failures of crops. About two years ago, I had referred to this subject in a public lecture, and happened, immediately afterward, to drive ten or twelve miles into the country, with an intelligent friend, who doubted the extent of the loss. We were driving through one of the oldest agricultural settlements in the Province, and, by way of settling the question, determined to observe the capability of each barn yard that we passed, for the preservation of

manure. It was in early spring, and we found scarcely one barn that had not its large manure heap perfectly exposed to the weather, and with a dark stream oozing from its base into the roadside ditch, or down the nearest slope; while there was evidently no contrivance whatever for saving the liquid manure of cattle. Here was direct evidence, that a large proportion, probably not less than one third, of the soluble part of the solid manure, and the whole of the liquid manure, which all agricultural chemists think to be at least equal in value to the solid part, was being lost. In other words, each farmer was deliberately losing between one-half and two-thirds of the means of raising crops, contained in his own barn-yard. What would we think of a tradesman or manufacturer, who should carelessly suffer one half of his stock of raw material to go to waste; and the case of such farmers is precisely similar. The results of chemical analysis will enable us to form more precise ideas of the nature and amount of this waste.

Composition of Solid Stable Manure (Richardson.)

Carbon,	37.40
Hydrogen,	5.27
Oxygen	25.52
Nitrogen,	1.76
Ashes,	30.05
	100.00

Composition of the Ashes of Stable Manure (lb.)

Potash,	8.22	Soluble in water.
Soda,	2.70	
Lime,	0 34	
Magnesia,	0.26	
Sulphuric Acid,	3.27	
Chlorine,	3.15	
Silica,	0.04	
Phosphate of Lime,	7.11	Soluble in Hydrochloric Acid.
" of Magnesia,	2.26	
" of Ox. of Iron,	4.68	
Carbonate of Lime,	9.34	
" of Magnesia,	1.63	
Silica,	27.01	
Sand, &c.,	34.96	
	100.00	

Composition of Liquid Manure (Bossaingault.)

	Horse.	Cow.
Urea,	31.00	18.48
Hipurate of Potash	4.74	16.51
Lactate of Potash,	20.09	17.16
Carbonate of Magnesia,	4.16	4.74
" of Lime,	10.82	0.55
Sulphate of Potash	1.18	3.60
Chloride of Sodium	0.74	1.52
Silica,	1.01	—
Water, &c.,	910.76	921.32
	1000.00	1000.00

Urea, the principal organic ingredient of Urine, consists of—

Carbon,	20.0
Hydrogen,	6.6
Oxygen,	46.7
Nitrogen,	26.7
	100.0

It is, therefore, very rich in Nitrogen. In decomposing, it changes into carbonate of ammonia, which rapidly escapes, unless prevented by some absorbent material, as charcoal, or by the chemical action of sulphuric acid or gypsum.

In the above table, we see that the liquid manure contains large quantities of potash and soda; and that a large portion of it is urea, a substance very rich in nitrogen, and, in fact, quite similar to the richest ingredients of guano. Johnston estimates the value of 1,000 gallons of the urine of the cow, to be equal to that of a hundredweight of guano. The farmers of Flanders, — who save all this manure in tanks,—consider the annual value of the urine of a cow, to be $10.

In the solid manure, we perceive that there is little nitrogen. This element, so valuable for producing the richer nutritious parts of grain and root crops, is principally found in the liquid manure. The little that is present, however, in the solid manure, is soon lost, in the form of ammoniacal vapors, if the dung be allowed to ferment uncovered. The other organic matters are less easily destroyed, unless the dung be allowed to become "fire-fanged," in which case the greater part of it is lost. In the ashes, or inorganic part, we find all the substances already referred to, as constituents of fertile soils; and many of the most valuable of them are, as the manure decomposes, washed away, and, along with a variety of organic matters, appear in the dark-colored water which flows from exposed dung-hills. It is not too much to say, that the loss of the volatile and soluble parts of manures, on ordinary upland soils, cannot be repaid by any amount of outlay in the purchase of other manures that our farmers can afford; and we can plainly perceive, that the prevailing neglect in this one particular, is sufficient to account for the deterioration of once fertile farms. How, then, is this waste to be prevented? In answer to this, I shall merely indicate the principles on which the means adopted for saving manures should be founded, with a few general hints on the best modes of carrying them into effect.

1. The solid manure should be covered by a shed, or roof, sufficient to protect it from rain and snow. Its own natural moisture is sufficient to promote, during winter, a slow and beneficial fermentation. Snow only prevents this from going on; rain washes away the substance of the fermented manure.

2. The ground on which the manure heap rests, should be hol lowed, and made tight below with clay or p'anks; and in autumn, a thick layer of bog mud, or loam, should be placed on it, to absorb the drainings of the manure.

3. When the manure is drawn out to the field, it should be covered as soon as possible, either in the soil, or, if it must stand for a time, with a thick coating of peat or loam,—a pile of which should be prepared in autumn for this purpose. All unnecessary exposure should be avoided.

4. Where gypsum can be procured cheaply, it should be strewed

about the stables, and on the manure heap, for the purpose of converting volatile ammoniacal vapors into *fixed* sulphate of ammonia. This will also render the air of the stables more pure and wholesome.

5. It must be borne in mind, that the richest manures are the most easily injured. For example, many farmers think horse manure to be of little value. The reason is, that when exposed it rapidly enters into a violent fermentation and decay, and its more valuable parts are lost. Such manures require more care than others, in protection and covering, so as to moderate the chemical changes to which they are so liable, and to save the volatile and soluble products which result from them.

6. The liquid manure should be collected, either in the pit or hollow intended for the other manure, or in a separate pit prepared for the purpose. The latter is the better method. If a tight floor can be made in the stable, it should be sloped from the heads of the cattle, and a channel made, along which the urine can flow into the pit. If the floor is open, the pit should be directly beneath it, or the ground below should be so sloped as to conduct the liquid into the pit. In whatever way arranged, the pit should be tight in the bottom and sides, and should be filled with soil, or peaty swamp mud, to absorb the liquid. Gypsum may also be added with great benefit; and the urine pit may very well form a receptacle for door-cleanings, litter which may accumulate about the barn, and every other kind of vegetable or animal refuse. These additional matters may occasionally be protected, by adding a new layer of peat or soil to the top. The pit for liquid manure should be roofed over. A method much followed in Britain and the continent of Europe, is to collect the urine in a tank, and add sulphuric acid to prevent waste of ammonia. When used, the liquid is diluted with water, and distributed to the crop by a watering cart. This is too expensive for most of our farmers; but when it can be followed, it will be found to give an astonishing stimulus to the crops, especially in the dry weather of spring. Gypsum may be put into the tank, instead of sulphuric acid.

This subject is, in all in its details, deserving of the careful study of every practical farmer. For further information on it, I may refer to the Letters of Agricola, Johnston's Lectures, Judge Peters' Hints, Jackson's Agriculture, Stephens' Book of the Farm; and, indeed, to modern agricultural books generally.

Other Organic Manures.—The remaining organic manures may be arranged under the following heads:

1. Those which, like peat, bog mud, leaves, spent bark, saw dust, straw, &c., consist principally or exclusively of woody fibre. These substances decay but slowly in the soil, and do not yield large quantities of the more rare and valuable of the substances required by

cultivated plants. They are useful, however, in two points of view. They renew the supply of vegetable matter in the soil, and thereby ameliorate its texture; and they afford, by their decay, substances useful in enabling plants to build up the tissues of their stems and leaves. They are also admirable absorbents for the richer parts of putrescent manures; and by mixture with these substances, they are themselves more rapidly decomposed. Their use, therefore, is, as already indicated, to fill the urine pit, to form the basis of the dung-hill and the cover of composts, and to serve as litter in the stable and cattle-yard. They may also be used in top-dressing grass,—which they not only nourish, but protect from the frosts of winter. For this latter purpose, straw has, in some parts of America, been spread over the fields of winter wheat in autumn; and there can be little doubt that, with a good covering of straw, winter wheat might succeed here.

2. A second class consists of the rapidly decomposing remains of animals and plants,—as dead animals, blood, night soil, fish offal, parings of hides, green succulent weeds, sea weeds, &c. The animal manures of this class, are of great value, being almost entirely composed of the materials which are most wanted for the production of the most nutritious parts of vegetables. The vegetable manures of this class, though less valuable, afford, in addition to their woody fibre, much alkaline matter, and some nitrogen; and some of them contain animal substances, which add greatly to their value. Such manures should not be left exposed, nor should they, except in case of necessity, be applied in a fresh state to the land; as in their raw state, a slight excess of them often exerts a poisonous influence, and much of their richness is also apt to be wasted. They should be mixed with earth or peat, in the proportion, in the case of the richer kinds, of three to one; and well covered with a coating of earth. The whole mass will thus become a rich and valuable manure. In many parts of this Province, there is sufficient fish offal, if treated in this way, to fertilize large tracts of barren land; whereas it is now totally wasted, or spread on grass land, to taint the air with odours which, if retained under ground, would furnish the elements of life and vigour to the crops. The same remark applies to dead animals, and all the putrescent refuse which is apt to accumulate about yards and outhouses. Exposed on the surface, these things are pestilential nuisances; buried in the compost heap, they are the materials of subsistence and wealth.

As *Sea Weed* is a very important manure, and is very extensively applied in many parts of this Province, a few additional remarks may be made respecting its composition and uses. The ashes of sea weed have been found to contain:

Soda and Potash, - -	15 to 40 per cent.
Lime, - - -	8 " 21 "

Magnesia, - - -	7 to 15 per cent.
Common Salt, - -	3 " 35 "
Phosphate of Lime, -	3 " 10 "
Sulphuric Acid, -	14 " 31 "
Silica, - - -	1 " 11 "

These are all important substances, and, in addition to the nitrogen contained in the organic part of the weed, must exercise an important influence. Sea weed, however, is but a temporary manure, as it decays very rapidly; and it is extremely unwise to place the whole dependence on it, to the exclusion of other manures, especially of the stable manure. The farmer should save his stable manure, and consider the sea weed an additional, or supplementary aid. In this way there will be no danger of his having to complain that, notwithstanding constant applications of sea manure, his land is becoming poor. He must also remember, that sea weed does not contain all the materials of land plants, in due proportion; and that, therefore, it cannot supersede the necessity of other fertilizers. With respect to composting sea weeds, some good farmers in the western counties compost carefully all the weed obtained in autumn, and apply, in the recent state, that procured in spring. It has also been successfully applied as an autumn dressing to grass. This is certainly better than the practice, which I have observed in some places, of top dressing grass with the stable manure, and applying nothing in the drills with green crops but sea weed.

Land weeds form a somewhat useful kind of manure, as they are often rich in alkalies, and other constituents of crops. Rank roadside weeds are especially valuable; and their removal prevents the dissemmination of their seed, and improves the appearance of the country. The ploughing in of green vegetables—as buckwheat, clover, or turnip tops,—may also be considered as the application to the soil of a somewhat rich vegetable manure of this class.

3. A third class is formed of those manures of animal and vegetable origin which, though highly fertilizing, are not liable to rapid decay; and are, therefore, permanent in their effects, and may be kept for application in a dry state. Such are bones, hair, hoofs, hen manure, guano, wood ashes, and soot.

Bones are of great value, as they afford that rare and important substance, phosphate of lime, along with a rich animal matter; ground bones, or "bone dust" are now an important article of traffic as manure, and are cheap to the farmer even at the rate of a dollar and a half to two dollars per barrel;—as five bushels are considered to be sufficient manure for an acre of turnips, especially if mixed with a little wood ashes. Every farmer should collect and apply bones. They are very valuable, even after being burned or boiled with potash for soap; because they still contain their phosphate of lime, though deprived of their animal matter. Where means for grinding bones

cannot be obtained, they may be broken into small pieces by the hammer: they may then be mixed with an equal quantity of earth or ashes, moistened, and left to heat before being put into the drills. For practical illustrations of the value of bones, I may refer to Jackson's Agriculture. Among other instances, he mentions, that a dressing of 600 bushels on 24 acres of poor pasture, had so improved the grass, as to double the yield of butter; and this effect endured for many years. In this case, the pasture had been laid down for ten years, and, no doubt, much of its natural phosphate of lime had been exhausted, to form a constituent in the milk and bones of the cattle that had fed on it. In another case, he mentions a ten-fold yield of turnips, and a great improvement in succeeding grain crops, as resulting from its application.

Hair and *Hoofs* are rich manures, though they decay slowly. Such substances from tanneries, etc., should be saved and applied to the land. At the rate of twenty or thirty bushels per acre, they produce marked effects.

Hen's Manure and *Guano* are very rich in nitrogen and phosphates, and may hence be regarded as the most concentrated form in which the most rare and expensive parts of the food of plants can be supplied. They contain, in the solid form, all the substances which are present in liquid manure, in a state of solution. From two to four cwt. of guano are sufficient on most soils to raise a good crop of turnips, and a succeeding grain crop: but as guano does not contain much of the ruder and more common organic matters useful in the soil, it is best to use one or two cwt. of guano, with half the usual quantity of other manure. To render the guano more easily applied, it should be mixed with sand or dry soil before sowing it.

The great value of *Wood Ashes* may be estimated from the remarkable effects produced by them in new land, where the ashes of forests,—the growth of centuries—are at once applied to the surface. The substances which they afford may be learned from the following analysis of the ashes of beech wood:—

Potash,	15.83	per cent.
Soda,	9.79	
Common Salt,	0.23	
Lime,	62.37	
Gypsum,	2.31	
Magnesia,	11.29	
Oxide of Iron,	0.79	
Phosphoric Acid,	3.07	
Silica,	1.32	

These are the principal substances on which new land depends for its fertility; and the loss of which, either by wasteful cultivation or

by repeated burnings followed by rain, causes its exhaustion. These ashes produce the best effects, when a considerable proportion of the vegetable matter of the soil remains unconsumed; both because this vegetable matter serves to retain the ashes, and because it prevents their caustic effects from being too strongly felt. On the other hand, when the vegetable matter is entirely consumed the ashes are rapidly wasted, and the crops suffer from deficiency of organic manure. Leached ashes, having lost their potash and soda, are of less value than recent ashes, but are still of great utility.

Ashes may be applied with any crop; but not in very large quantity, as they not only act powerfully as a manure, but exert a caustic or decomposing influence on organic manures and the roots of plants. Fifty bushels per acre is the largest quantity that can be safely applied to heavy soils, rich in vegetable matter. Lighter soils should have a much smaller quantity; and on light soils even a few bushels will produce marked benefits. *Kelp*—or the ashes of sea weed—and peat ashes, are similar in their effects to wood ashes, but less powerful.

Soot contains ammonia, and sulphates, carbonates, muriates, and phosphates of lime, potash, soda, magnesia, &c. It is, therefore, a very powerful manure, and, like guano, need be applied, but in small quantity.

To this class of manures, I may add the heads and back bones of codfish, which may be obtained in large quantity in some of the fishing districts. If dried, and packed in old barrels or crates, they might be preserved, and conveyed into the interior districts. As they consist entirely of phosphate of lime, and rich animal matter, they are nearly as valuable as guano, and would be well worth 5s. or 6s. per cwt. They should be cut up, or crushed, and mixed with soil, to ferment before being applied. They should be used in drills with potatos or turnips.

It may also be of service to add here, that night soil, urine, and other offensive animal substances, may be converted into a manure of great power, and quite inoffensive, by mixing them with powdered charcoal, or charcoal and gypsum. They may then be sown like guano, and will produce similar effects. Artificial manures, called *poudrettes*, are often prepared in this way. Farmers would find it profitable, to have constantly at hand a quantity of charcoal and powdered gypsum, for such purposes.

Mineral or Inorganic Manures.

After what has been already said, it is scarcely necessary to mention here that manures of this kind may be as truly the food of plants as substances that have already actually formed parts of vegetable

substances. Any of the substances mentioned above as necessary ingredients in fertile soils, or in the ashes of crops, may produce valuable effects, if they can be procured from the rocks of the earth, or any other source, and applied to the land. The beneficial influences of these substances may be summed up under the following heads :—

1. They may supply original chemical or mechanical wants in the soil; they may furnish substances required by some or all crops, and previously deficient; and thus not only directly promote their growth but enable them to avail themselves of other materials which, though abundant, they could not use, from want of that which was deficient. For instance, if clover contains in its ashes 28 per cent. of lime, and if the soil contain so little that, in the course of the season, it can only get half the quantity it requires, it will take just so much less of everything else that it requires, and produce little more than half a crop. Hence the addition of lime to such a soil will enable clover to take a great deal more of other kinds of food, and the effect on the crop will be very marked. On the other hand, if the soil contain a sufficiency of lime, its addition as a manure may produce no appreciable effect. We learn from this, the nature, in part at least, of what is called the stimulating and exhausting effect of mineral manures, and also the reason of their frequent failure. A farmer who finds by experience that some mineral ingredient, as lime, gypsum, &c., produces marked benefits, continues to apply it, and neglects other manures, until at last it produces no effect, and he finds that his land is completely run out. He now says that, after all, his supposed fertilizer was only a "stimulant," and condemns it; whereas the error is in his own ignorance of the fact, that though necessary to fertility, it only rendered more necessary a sufficient quantity of the other kinds of food required. It is just as if a farmer were to find the appetite and flesh of his cattle falling off, and were to add some salt to their food; and finding this to remedy the evil, were to withhold all other nourishment and attempt to feed them on salt alone. It is easy to fall into an error of the opposite kind. A farmer, anxious to improve, learns that great benefits have resulted from some mineral manure. He at once applies it on a large scale, and is surprised to find that it does no good whatever. The reason probably is, that his land has already enough of it, while that to which it has been successfully applied had not He should have ascertained by experiment on a small scale, or by an analysis made by a competent person, the actual state of his land in reference to this particular substance; and then he might have proceeded with certainty. These errors, arising from imperfect knowledge, work incalculable mischief to the cause of agricultural improvement. The true course with respect to mineral manures, is to test the land as to its wants; and then, if needed, to apply them, without neglecting other ordinary manures.

2. Mineral manures may produce chemical changes in the soil,

which may preserve or render useful other substances previously present, or may decompose poisonous ingredients. I have already had occasion to notice the effect of gypsum in saving ammonia, and that of lime in decomposing sulphate of iron, and neutralizing vegetable acids; and lime also exerts a powerful influence in decomposing inert vegetable matter, and even small stones and gravel which may contain matter useful to the soil. This is what we may call, if such a term can be properly used at all, the true *stimulating* effect of mineral manures.

After these general remarks, it will not be necessary to dwell at any great length on the separate mineral manures. I shall therefore briefly indicate their uses, sources, and the modes in which they may be best applied.

Lime is an important ingredient in the ashes of most plants. It also renders the soil lighter, and promotes the decay of vegetable matter. In consequence of this last property, it can be applied in the largest quantities to heavy lands, rich in vegetable matter; on light and poor lands it should be used with caution. I have already pointed out in treating of soils, many kinds of land to which it may be advantageously applied; and where this is doubtful, an opinion of its necessity may be formed by observing whether the crops already referred to as containing much lime, such as clover and some of the green crops, thrive on the land in question; and by trying experiments on a small scale. Where competent chemical aid can be obtained, an analysis of the soil may be resorted to in cases of difficulty.

Lime exists most abundantly in the state of carbonate, either in the form of limestone or in the substances called marls, and which consist of mixtures of carbonate of lime with sand and various earthy matters. Lime, in both of these states, is abundant in various parts of this Province; though, as already pointed out, those tracts whose soils are most deficient in lime, are precisely those in which beds of limestone and marl are most rare.

Marl is found in large beds in all those parts of the Province where large beds of limestone and gypsum exist. These large marl beds are usually of grey or brown colours, and often contain small irregular veins of gypsum. The decaying surface of many beds of limestone also affords a substance which may be classed with the marls. In some low grounds which have formerly been ponds or lakes, there are beds of clay mixed with fresh-water shells; and in creeks and harbors there are mussel and oyster beds which afford a similar substance, containing also much valuable animal matter; these may be called shell marls. On some parts of the coast also, large quantities of seashells, mixed with marl, may be collected on the beach, and may also be called shell-marl, as they are quite analogous in composition and

effects. All these substances may be applied in large quantity with benefit to most soils, more especially as in this mild state the lime exercises no destructive influence on the organic matter of the soil. The earthy marls may be used for mixing with composts, or laid on as a top-dressing. The shell marls which contain much animal matter, should be covered and composted with earth, and applied with root or grain crops. Marls may be distinguished from common clays and sands by a very simple test. Put a little of the substance into a wine glass or tumbler, and add a little water, sufficient to make it into a thin paste. Then pour in a few drops of muriatic acid, and observe if any effervescence or boiling up occurs. If a good marl, it will boil up with considerable force; if a poor one, with less force; and if not a marl at all, there will be no effervescence or scarcely any. Limestone may be distinguished from other rocks in the same way.

Limestone ordinarily requires to be burned in order to be rendered fit for application to land. Burning deprives it of its carbonic acid, and brings it into the state of quick or caustic lime, or after it is slaked and reduced by water, into that of hydrate of lime, or lime combined with water. In these forms, it is most suitable for mixing with crude vegetable matters, as peat, which it is desirable speedily to decompose, and for application to some bogs; but in these forms its application in large quantity to very light soils is most dangerous. It remains, however, but a short time in the state of caustic lime, for whether in the soil or on the surface, it gradually absorbs carbonic acid from the air and from the organic matters with which it comes into contact, and passes back into the state of carbonate, the same state in which it was before being burned; so that ultimately the principal result of the burning is that of reducing the lime to fine powder, which can be uniformly diffused throughout the soil. This change does not, however, fully take place for a very long time. It is principally this strong affinity for carbonic acid, which causes lime to hasten the decomposition of organic matters, by creating a powerful demand for the carbonic acid, which is one of the principal products of their decay; and as this carbonic acid is a useful part of the food of plants, in poor soils an excess of caustic lime not only wastes the organic matter, but takes away the little vegetable food which it is producing. In like manner, caustic lime is altogether unsuitable for mixing with rich animal manures, as the rapid decay which it induces sets free and wastes all the ammonia which they contain. This is well shown by mixing a little quick lime with guano. The intense odour of ammonia given off, indicates at once the destructive action of the lime, and the large quantity of ammonia in the manure. If a rod dipped in muriatic acid be held over the mixture, the ammonia becomes visible as a white cloud of muriate of ammonia.*

* The same test indicates the escape of ammonia from rich manures, when decaying too rapidly.

As a decomposing agent, then, quick lime is most rapid and efficient, but mild lime acts in the same way, though more slowly. To the action of both kinds, however, the presence of air is necessary. The oxygen of the air is necessary to the decay of all kinds of organic manure, and since lime acts in promoting decay, its influence will in a great measure depend on greater or less readiness with which air can penetrate to the vegetable matter of the soil. For this reason when lime is mixed with organic matter in close vessels or in very stiff impermeable clays, it tends to harden and preserve, rather than to decompose it; in such soils, therefore, draining and loosening the ground are necessary in order that lime may exert its proper influence.

The decomposing power of lime explains its beneficial influence on peat-bogs, and other soils surcharged with moisture and undecayed woody matter. In such places the vegetable matter long soaked in stagnant water, produces in the slow changes which it undergoes, the Humic, Acetic, and other organic acids, which communicate what is very properly named sourness to the soil, and render it fit only for the growth of coarse grasses, ferns, moss, and similar plants But when lime is applied, it enters into combination with these acids, and at the same time causes the inert woody matter to decay and fill the soil with valuable articles of food for plants. It is to this cause that we must also in great part ascribe the beneficial change which lime effects in pasture lands overgrown with coarse grasses, or more useless herbage, causing this rank vegetation to give place to tender grasses and clover. In all these cases the lime is merely the means of bringing into useful form a quantity of matter previously existing in the soil in an active or positively injurious state. In the case of swampy land, however, we must not forget that lime will prove only a partial and temporary remedy, unless it be assisted by draining.

The facts already stated will enable us to understand the utility of composting peat, black swamp mud, and similar substances, with lime; by the decomposition which they are caused to undergo, they are converted into valuable manures.

Since the benefit of lime arises in great part from its power of bringing into use the stores of food already present in the soil, it is plain that its effects must be greatest in soils which contain abundance of vegetable matter, and also that its tendency is to *exhaust* this matter more rapidly than if lime were not used. Heavy liming, therefore, when not accompanied with other manures, must, at each successive application, produce less effect, and end in causing comparative barrenness. From observing this injurious effect of the misapplication of lime has arisen the English proverb that "Lime makes rich fathers, but poor sons." The Germans have a better proverb, to the effect that heavy liming and and heavy manuring must go together.

These considerations also show how lime may "burn up" and impoverish some light soils, by wasting with unnecessary rapidity their already small stock of vegetable mould. To such soils lime should be applied, either in the form of clay marl, or of composts made of peat, sods, ditch cleanings, or similar matters, which will furnish it with materials to act upon, without exhausting the soil.

Lime also exerts an important *influence on the inorganic materials of soils.* It has been already mentioned that the soluble salts of iron present in some boggy lands, and injurious to vegetation, are decomposed by lime, owing to its superior affinity for the acids which they contain. In soils which contain common salt,* lime acts upon this substance, combining with its muriatic acid, and leaving the soda in the form of carbonate, a state in which it is very useful to vegetation. For this reason, one of the best ways in which salt can be applied to land, is in a state of mixture with quick-lime. Such a mixture, in many soils, produces very beneficial results. Another change of the mineral matter of the soil, effected by lime, depends on its affinity for silica, which is sufficiently powerful to enable it gradually to decompose fragments of granite, trap, and other rocks, consisting of silicates, combining with their silica, and setting free their potash, soda, &c., in forms very useful to crops. Besides these, there can be little doubt that lime aids in effecting many other changes among the mineral ingredients of soils, tending in many cases to make their constituent parts more available for the nourishment of vegetation.

Duration of the effects of Lime.—When lime, in the quick state, is placed in the soil, it acts energetically, from the moment of its application, until it is reduced to a state of partial mildness, when its influence is exerted more slowly. The slower action, however, continues with unabated, or even increasing vigor, for two or three years, and although it may then diminish, the influence of a heavy liming may be felt even thirty years after its application. The decrease of the influence of lime may be accounted for in different ways. It is usually applied only to the soil near the surface, and has a tendency to sink downwards into the sub-soil. In light soils, this may be caused by the fineness of its particles, which causes them to be washed down between the coarser grains of the soil. In rich and close soils, however, it is very probably due to the earth-worms, those industrious agriculturists, which are constantly employed in carrying to the surface the finer parts of the soil, on which they feed, a process which must result in the burying of every substance which they are not inclined to devour. Lime is also dissolved by water impregnated with carbonic acid, and is rendered soluble by combining with various acids present in the soil, and in these states much of it is absorbed by the roots of crops, and much washed away from the ground by rains. Another mode in which the influence of lime may gradually become

* Muriate of Soda.

insensible, is by its combining with silica, and forming an insoluble compound, possessing none of the active properties of lime.

Quantity of Lime which should be applied.—When land is originally destitute of lime, a large quantity may be mixed with the soil, with beneficial results. This will be evident when we consider that in order to give one per cent. of lime to a soil six inches deep, we must apply about three hundred bushels of lime to an acre. If, therefore, the lime be well mixed with the soil, a large quantity may be used without producing any very great change. The quantity of lime which should be applied, depends, however, in a very great degree, on the nature of the soil. Clay ground and swampy land are often benefitted by very large doses; as much as seven hundred bushels on the acre have been added to land of this description, without producing any material difference. Light and sandy soils, on the other hand, may be injured by a dose which would be much too small for clay land. To these circumstances, therefore, attention must be paid, as well as to the proportion of lime naturally present.

Since lime gradually disappears from the soil, it is necessary that the supply should be renewed at intervals; and it is plain that a more uniform effect will be secured by adding small quantities frequently, than by using large doses at long intervals. The practice of farmers, has, however, varied very much in this respect, according to their various circumstances. In some parts of Scotland, forty bushels of shells per acre are applied every five or six years; in others, two hundred to three hundred bushels are used once in nineteen or twenty years. In Flanders, ten to twelve bushels are applied once in three years, or forty to fifty bushels once in twelve years. In many parts of England, lime is applied once in every rotation of three or four years. The different length of the intervals in these cases does not appear to be of very great importance, and may be varied by every farmer to suit his own convenience. Small applications, at short intervals, are, however, evidently safer and more efficacious than large doses seldom repeated.

Enough has now been stated to show the uses of lime and their reasons, and to prevent us from being deceived by the hasty assertions respecting its utility and inutility, frequently made by persons whose views on the subject are only partial. The result of an enlightened view of what is known with respect to this valuable manure, may be summed up as follows:—

1st. Lime has *ultimately* the same effects whether it be applied in the quick, air-slated, or mild state: it should be well mixed with the soil, but kept as near the surface as possible; and it should be renewed at intervals of a few years.

2ndly. The mechanical effects of lime in opening and loosening the soil, are always beneficial on heavy soils, except where these are very wet and undrained; and, on the other hand, they are sometimes injurious to very light and dry ground.

3rdly. The chemical effects of lime, when properly applied, are, affording a necessary part of the food of crops; bringing into activity the inert vegetable matter of the soil; and decomposing some mineral compounds which are injurious to vegetation, and others whose constituents are of great utility when set free by its action. By these means it tends to discourage the growth of moss and many other useless plants in pastures and hay fields, and encourage that of valuable grasses and clover; to increase the quantity and improve the quality of grain and green crops; and to augment the benefit of vegetable manures.

4thly. When applied to land already abounding in lime, or very deficient in vegetable mould, it may produce no benefit; and applied in too large quantity, or when not accompanied with sufficient supplies of vegetable manures, it may be highly injurious by exhausting and impoverishing the soil.

5thly. Just as some cultivated plants cannot thrive without a good proportion of lime, there are some wild plants native to poor non-calcareous soils which are destroyed by liming. Hence, liming and sowing with grass are sometimes sufficient to replace the most useless plants by nutritious grasses.

Some varieties of limestone contain a large proportion of magnesia, which, when added to the soil in large quantity, produces an injurious effect. I am not aware that any limestones in this province are highly magnesian, except the ferruginous limestone found in connection with iron ores in the hills of Londonderry and a few other places.

2. *Gypsum.*—The uses of this substance have already been often referred to. 1. Gypsum supplies sulphate of lime to crops, and, in general, is the cheapest form in which the sulphuric acid—shown by analysis to be present in the ashes of cultivated plants—may be obtained by the farmer. For instance, 1000 lbs. of dry clover and timothy hay, contain from $3\frac{1}{2}$ to $4\frac{1}{2}$ lbs. of sulphuric acid; or we may estimate the quantity of sulphate of lime, or gypsum, required by a moderate hay crop, at 20 to 30 lbs. per acre. When gypsum is naturally deficient in the soil, great results may be expected from its application, especially in the growth of those crops which contain large quantities of this substance. 2. Gypsum possesses great value, from its property of decomposing the carbonate of ammonia,—one of the most valuable products of the decay of animal substances. This action may be represented thus:

$$\left.\begin{array}{c}\text{Carbonate of Ammonia}\\ \text{and}\\ \text{Sulphate of Lime}\end{array}\right\} = \left\{\begin{array}{c}\text{Sulphate of Ammonia}\\ \text{and}\\ \text{Carbonate of Lime.}\end{array}\right.$$

The carbonate of ammonia rapidly passes off in vapour; but the sulphate remains in the soil or the manure. Hence the importance of this change to the farmer.

The influence of gypsum is thus very different from that of lime or

marl. It does not tend either to waste or render available the vegetable matter of the soil; nor does it remove the sourness and coldness of heavy soils. On the contrary, it rather tends to give body to light soils. Its uses, however, are very important; and in a country where gypsum is so abundant as in Nova Scotia, it is singular that it is not more extensively employed. This may be attributed, in part, to the following causes: In the vicinity of the sea, experience has shewn that gypsum is less useful than further inland; apparently because the sea spray carried by the wind supplies to the soil a small quantity of sulphate of soda, which serves the place of gypsum. Again, many soils in this Province, especially those in the vicinity of the gypsum beds, are already well supplied with this substance; and some soils in the slaty districts, though deficient in gypsum, receive supplies of sulphuric acid from the sulphuret of iron contained in the slate. Coal ashes and sea weeds, where applied, also furnish small quantities of gypsum. There are, however, many soils in this Province, especially in the hilly districts, which much need gypsum; and it is more likely to be useful in places remote from the sea and from the gypsum quarries, which, in the present state of our agricultural operations, are, of course, the least likely to obtain it. The second use of gypsum, however, to which I have referred, is one that applies to all soils and situations. In the stable, the urine pit, the dung hill, and the compost heap, gypsum is always useful; and when scattered on the potato or turnip drills, or the hills of corn, it will always stand sentinel over the rich manures beneath, and preserve their ammonia in the soil. This is especially true in the case of light sandy soils. For such uses, every good farmer should always have at hand a supply of powdered gypsum.

The cheapest way of rendering gypsum fit for use, is to break it into pieces, and burn it after the manner of lime—though it does not require so great heat as limestone. Burning only drives off its water, without producing any other chemical change. After burning, it may be easily crushed into powder; but must be kept dry,—otherwise it will set into a solid mass. The fine rubbish of gypsum quarries, and also the marly beds in their vicinity, may often afford a very cheap supply of gypsum. It is to be hoped that the home demand for gypsum may soon become sufficiently extensive to enable plaster mills to be established in every county in the Province.

It may seem contrary to the above remarks in reference to gypsum, that in the United States, where plaster has been largely applied, it has been accused of running out, or impoverishing the land. This is well explained by Norton, on a principle already referred to:—"In many cases, a few bushels per acre bring up land from poverty to a very good bearing condition; complaints are, however, made, that—after a time—it injures the land, in place of benefitting it. This, in almost all instances, results from using it alone, without applying other

manures at the same time." The explanation is of the same general nature as that given under lime. The farmer has taken away a variety of substances, and has only added gypsum. If the land is entirely exhausted at last, under such treatment, it is obviously not the fault of the gypsum. There are many large districts where it produces no effect; but it may always be considered certain, that where gypsum or lime does no good, there is already, in one form or another, a supply of both naturally in the soil; or, as has been previously explained under lime, there is some physical or chemical defect which prevents their action.

3. *Potash and Soda.*—The sources of these, in the ashes of plants, have been already referred to; and there are not many ways in which they can be directly obtained from the mineral kingdom.—Sea salt contains soda, in combination with chlorine; and it may be made to afford pure soda, by mixing it with quick lime. It will generally be found very useful to slake lime intended for land with sea water; and no better use can be made of refuse salt or brine, than to pour it upon quick-lime, or mix it with a lime compost. Granite contains a large proportion of potash; and though a granite compost may seem a strange thing, crushed granite has actually—in England—been mixed in heaps with quick lime, for the purpose of setting free its potash. This is the only recipe that I know, for meeting the wishes of a gentleman in one of our more rocky districts, who once said to me—"There would be some use in your agricultural chemistry, if you could dissolve these granite rocks for us." Farmers who can obtain the smaller dust and fragments of granite quarries, and masons' sheds where granite is worked, and who are not located on granitic soils, will find it pay to cart such material, and mix it with the lime they intend to apply to their land, covering the whole with a thick coating of clay, and letting it stand for a few months. The effect will be greater, if the granite be previously burned, like the lime. The softer varieties of trap rock—which also contain much alkaline matter—may be treated in the same way; or may be usefully applied to poor soils without any preparation.

4. *Phosphate of Lime.*—Small quantities of this highly valuable substance are contained in most limestones, and conduce greatly to the benefits resulting from liming. Those varieties of lime which contain large numbers of impressions of shells and scales of fishes, are usually most valuable in this way. These are on the Joggins shore, at Horton Bluff, Lower Horton, Chiganois River, and also—if I remember correctly—near the Sydney Mines, some thin, black, layers of limestone; which contain so large a quantity of remains of fishes, that their value to the farmer must be much greater than that of ordinary limestone. Were it not for the difficulty of detecting imposture in such matters, the lime from some of the richest of these lands, might bring a highly remunerative price as a mineral phosphate.

Coal Ashes.—The ashes of Pictou coal consist principally of silicia and alumina, which constitute over 86 per cent. of their weight.—These substances are in a fine state of division, and give the ashes a great power of absorbing liquids and gases. They also contain oxide of iron, carbonate of lime, sulphate of lime, magnesia, and minute quantities of silicates of potash and lime, and of phosphate of lime. The latter is apparently derived from remains of the bones of fishes, which occur plentifully in some of the beds associated with the coal; and probably also, in small quantity, in the coal itself. The ashes of Sydney coal are less valuable, as manure, or as an absorbent of manures; but neither of them contain any ingredients which can be injurious to crops, as is said to be the case with the ashes of some English coals.

I may conclude the subject of mineral manures, by giving the following statement, from Johnston, of the matter that would be necessary to supply the inorganic substances taken off in the ashes of a four years' rotation of crops, consisting of turnips, barley, hay and clover wheat; on the supposition that the whole produce is taken off the land, and nothing restored. It is based on accurate chemical analysis—

Carbonate of Potash,	325 lbs.
Carbonate of Soda,	333 "
Common Salt,	43 "
Gypsum,	30 "
Quick Lime,	150 "
Sulphate of Magnesia, (Epsom salt),	200 "
Alum,	83 "
Bone,	210 "

It is evident, that if much of the bulky parts of crops be sold off a farm, or if there be a considerable waste of the manure produced from the crops, there must soon be occasion to resort to the application of mineral manures, even in the case of land naturally fertile.

I trust that enough has now been said, to guard the farmer against many one-sided and absurd views that are attempted to be palmed upon him as scientific and practical truths, in reference to mineral manures. Some writers inform us that stirring the ground is sufficient to supply inorganic manures—and, no doubt, this is highly useful, in promoting the decay of substances in the soil which may afford such manures; but it never can give one atom of any substance actually deficient.—Others take up lime, gypsum, bone-earth or alkalies, as if some one of these were the whole source of fertility. Others decry mineral manures altogether. All of these partial views are equally at variance with sound science and practical experience, which unite in teach-

ing that soils and crops *may* want any or all of these substances; and that the question—Which should be applied most freely? can only be answered satisfactorily by a knowledge of what is most needed in the circumstances of the case.

I cannot better illustrate the kind of errors to which I refer, than by the following singularly absurd statements, from an American periodical, which—to do do it justice—is, generally, much better informed on such subjects than most of the ordinary newspapers.—The writer says:—

It is well known, that Liebig has favored what is termed the "mineral manure" theory; while the late Professor Norton held different views, and believed in nitrogenized manures—that is, manure produced by decaying animal and vegetable substances. In England two farmers—Messrs. Lawes and Gilbert—have been experimenting, to test the two kinds of fertilizers. Their experiments have extended over a number of years, and have been on quite a large scale. They took a field at the close of a four years' rotation, when the manures added at the commencement of the course were exhausted. On this ground they have cultivated wheat for ten years, under various circumstances. One part remained unmanured, and the produce of this formed a standard for comparison during the whole period. Thus, if its yield in 1845 was seventeen bushels per acre, the improvement over this in an adjoining plat, otherwise the same, was set down to the advantage of whatever manure had been employed. Such a system of cropping, continued for so long a time, affords results that are worthy of much confidence.

[The writer then proceeds to state that mineral manures produced little or no benefit, while nitrogenized manures gave marked beneficial results.]

The fallacies contained in the above extract, any boy who has studied Johnston's Catechism, or any attentive reader of the foregoing pages, should be able readily to detect. In the first place, no such opinions as those referred to have—within the last ten years—been held by any chemist of note. All have admitted the necessity of *both* nitrogenized and mineral manures; though there may have been differences of opinion as to which were most necessary in certain circumstances. In the second place—supposing such one-sided views to be held—the method adopted by the farmers referred to could not settle the question, unles they took measures, in the first place, to ascertain the precise composition of the soil with which they had to deal—which it does not appear that they did. If it already contained a sufficiency of the mineral constituents of wheat—then, of course, mineral manures were unnecessary. If—which, in the circumstances, was less likely—it contained a sufficiency of nitrogenized manures, then these would

produce little effect. All, in fact, that resulted from these laborious and costly experiments, was, to make it probable, that the plat experimented on contained originally a fair proportion of the inorganic constituents of wheat—a fact which could have been much more easily learned in another way—and to deceive the experimenters, and perhaps some others, into the belief that they had settled a great practical question, and proved mineral manures to be valueless on all soils. Such errors are very injurious to the progress of scientific enquiry and damp the ardor of men desirous of information—more especially as they meet us on every hand, in the popular works of the day.—The only remedy is to familiarize ourselves with the results of scientific enquiry and enlightened experiment, and thus enable ourselves to judge of the value of everything new that may claim our attention.—In a subject so complicated, and advancing so rapidly, we may commit errors in application to particular cases, or may be left a little behind those who are in the first ranks of discovery; but we shall—with ordinary care—be in little danger of falling into grave or fatal mistakes.

Management of Animal Manures.

Under this head I have extracted from Youatt, Judge Peters, and Young's Letters of Agricola, some valuable facts and opinions bearing on the all-important subject of the preservation and restoration to the soil of the manure afforded by the animals supported on it. Neglect on this point has ruined multitudes of farmers; and enlightened attention to it is the most important agency in preserving fertility and securing gradual improvement. The extracts from Youatt and Peters will be new to most agriculturists in this Province; and those from Agricola, though they have been extensively read in bygone years, are little known to the younger race of farmers; though, I am sorry to say, about as much required by some of them as they were by their fathers.

(1.) *Youatt on Manures.*—"Dung dropped by fattening cattle possesses more fertilizing properties than the dung of lean cattle The dung of those fed on rape, linseed, or other oleaginous seeds, is the richest; that of animals supplied with oil cake, or those seeds of which the oily matter has been expressed, is next in fructifying powers; then the dung of cattle fed with roots; next that of such as are supplied with hay varying according to the goodness of their keep; that of straw-fed cattle, especially lean beasts, is the poorest of all."

"With regard to the relative power of animal dung, it may be observed that *horse dung*, when not too new, is admirably calculated for cold, sterile, and poor ground, the faults of which it corrects, while that of neat cattle is better adapted to warmer soils; but both, when

combined together, or with earth or mud, are useful on any soil. The effect, however, is but transient, excepting in moist, tenacious soils, and even there it produces no permanent amelioration. When dung is thus used by itself on moist clayey soils, it should be carried and turned in as soon as its first stage of fermentation has subsided; but when it is intended to be used on warm, light soils, it will be best to mix it with succulent vegetable substances, or earth or turf."

The dung of swine is of a fatter and richer nature than that of any other animal, and is supposed to be particularly excellent for grass lands and for cold clays. Sprengel, however, says: It is the slowest to undergo decomposition—developes, in its putrefaction, little, if any heat, and yields scarcely any ammonia. Esculent roots, manured with pigs' dung, acquire a disagreeable flavour, arising probably from a peculiar volatile substance emitted by the dung, or rather the urine, of the pig."

"There can be no doubt that, without preparation, it is not well to apply it to land. Incorporated with the manure heap, mixed with that of cattle, and there allowed to decompose and ferment, it becomes valuable. Mr. Pococke, of Thilstone, states that, knowing the excellence of pig manures, he has erected a large, dry shed, in which, first of all, he puts a layer of dry coal ashes, about a foot deep and four feet wide, to which he has all the deposits of the pigs, both fluid and solid, carried; as soon as it begins to ooze out, he adds more ashes, until the heap is about four feet high. A fresh layer is then commenced, and treated in the same way. After lying some time, it is turned twice or thrice, and is then fit for drilling. He tried it for turnips, and found the results far superior to those of guano, and equal to bone dust. The droppings of three pigs, if carefully thus preserved, he considers are ample dressing for three acres of land."

"The common mode of applying *sheeps' dung* is by *folding;* the benefit thus obtained is said to be derived from the consolidation of the land effected by their treading, and from their urine, to which may perhaps be added the perspirable matter exuded from their fleeces while lying upon the ground; but we question whether the volatile principles of the manure are not evolved under this system, and given off into the air. To secure real benefit from folding, it has been recommended that, as the fold is shifted, the land it has occupied should be immediately breast-ploughed, in order to cover in the manure and condense its ammoniacal gases within the soil."

"In too many farms the *urine* is allowed to run from the yard and stables into the horse-pond. This is an extravagant and reprehensible practice without any assignable reason to recommend it; still, where it is persevered in, it may be turned to some account by employing such pond water as a sprinkling or top-dressing for meadows. Mr. Guyde, in a paper sent to the Highland Society of Scotland, calculates that for every 10,000 lbs. of the urine of the horse that is

allowed to go to waste, the farmer loses 600 lbs. of dry matter of a highly fertilizing nature; and that for the same quantity of the urine of the cow, the loss is 700 lbs. of dry matter. In Flanders the urine of each cow is valued at £2 per annum. These things have been too little thought of."

"Many interesting accounts of economical modes of collecting and applying the urine of cattle as a manure to land, have been communicated; we select one which appeared in the "Farmer's Magazine," given by an intelligent farmer in the vicinity of Peebles. The farm-buildings were so disposed that the urine of all the stalls was conveyed by trunks to a dung pit, and the dung laid in a place appropriated to that purpose, instead of being thrown into the middle of the yard. The dung pit was twelve yards square, and four feet deep; and filled with mould previously carted into it, for the purpose of being impregnated with the urine and moisture of the dung. This pit produced about 288 cart loads, forty of which were sufficient for an acre. The expense of filling the pit is calculated at about £6; so that the advantage of the method is too obvious to be mistaken.

A German Professor—M. Schubler—instituted a variety of experiments on the comparative value of different species of dung:—

3 times the quantity of seed sown were produced, when no manure was employed.
5 times, when the ground was dressed with old herbage, or grass, or leaves.
7 times, with cow dung.
9 do., with pigeon's dung.
12 do., with human urine.
12 do., with sheep's urine.
14 do., with human dung or bullock's blood

"It cannot be too often repeated, that in no way are manures more wasted than by constant exposure to the sun, air, and rains; hence various expedients have been resorted to in order to prevent this loss. Among these are—the mixing it with dry earth, pulverized or burnt clay, charcoal, dry or charred peat, or other absorbent substances which will, in a great measure, prevent this inconvenience; the erection of sheds over dung heaps; the covering of these heaps with turf sods, (the grassy side downwards), where the dung is kept until it is old; and the formation of tanks and reservoirs."

Mr. Prideaux recommends "a staunch pit, rather deep than wide, being made to receive the drainings; a bed of humous earth may be first laid down, inclining toward the pit. Upon this spread hard stalks, etc., which are slow to decay, then a layer of dung, mixed, from the cow-houses, stables and sties, sprinkled with salt; next a layer of vegetable matter, as weeds, roots harrowed up, hedge clippings, fallen leaves, and other recent herbage, of the same thickness, dusted with

slaked lime; upon this a four-inch layer of peat, bark, saw-dust, sods, ditch or pond scourings, scrapings of the roads, or coal ashes; then, beginning again with the salted dung, and adding the vegetable and humous layers until the heap is four or five feet high, always keeping the lime from coming in contact with the dung. Then pour over it the liquid drainage, till all is soaked through, and continue to repeat the layers, pouring the drainage upon every four feet of thickness.—As the fluid passes through, it will dissolve the salt and lime, and carry the juices throughout. Slope the top of the heap, and cover it with straw, to carry off rain. Have gutters to carry off the fluid to the liquid manure heap—and, in six months, the heap will be ready for use."

"In addition to the numerous articles enumerated in the preceding chapters, we would observe that, before the winter or fodder season commences, the surface of the cattle-yard may be raised by spreading thereon fern, leaves, refuse straw, peat, and similar vegetable matters. Every previous arrangement being thus made, the cattle should be kept within their yards throughout the winter season; but the greatest care must be taken to keep them dry, which will be difficult if the manure be allowed to accumulate; therefore, where they are numerous, the surface litter of the yards may be removed to the dung-meers, and fresh laid down, as already mentioned. A common method is to have the centre of the yard concave, so as to receive the drainage from the surrounding sheds and stables—which, being covered with litter and trodden by the cattle, soon becomes fit for the dung-heap. This,—so far as the manure is concerned—is an excellent method; but, as the health of the cattle is also an important consideration, whenever the litter has been completely saturated, it should either be covered with dry straw, or removed."

"Agriculturists are by no means agreed as to the point of allowing their beasts litter to lie on, and thus consuming their whole stock of hay or straw; or arranging the floors in such a direction that they may be kept clean by sweeping only, and litter rendered unnecessary. The latter practice was at one time adopted by the late eminent breeder, Mr. Bakewell, and sanctioned by many agriculturists. It would—at first sight—appear obvious that the largest quantity of dung must be produced by the straw and coarse food being consumed by lean beasts—while the richer and more succulent is eaten by the fatting beasts—whether neat cattle, sheep or lambs. Mr Bakewell, however, seems to have found that such was not the result, for he afterwards modified his system, and used a portion of the straw as litter, in which state it absorbs the urine, and does not permit any part to be lost. Urine is generally admitted to be of far more value than straw that has been merely masticated and digested, without being combined with richer food. Liebig says:—'With every pound of urine wasted, we lose a pound of wheat.'"

"The augmentation of manure necessarily depends on the nature and application of the food given to animals. We have already pointed out the various articles of the vegetable kingdom, as well as the artificial foods that are best calculated for feeding and fattening cattle; and have endeavored to evince the superiority of *soiling*, both as respects the economical consumption of food, and also the production of manure. The quantity of manure produced by a farm, may also be increased by having *standing sheep folds*. For this purpose, in Flanders the ground is marked out, and spread with dry sand four or five inches thick; on this are erected slight sheds, in which the sheep are housed at night, a small quantity of dry sand—for which dry peat, &c., may be substituted—being laid in, every evening. This is cleared out once a week and carried to a dunghill, or spread upon the soil. The manure thus produced is well calculated for fertilizing almost every kind of ground, and makes an excellent dressing for cold and stiff soils. Dry stable litter, from which the dung has been shaken out, may also be advantageously used in folds."

Dung Steads may be tended and the manure augmented at different times, when no other business of greater moment stands in the way. They should be guarded from being torn or spread about by the scratching of poultry, or by swine, and therefore when in or near the farm-yard, should be surrounded by fences. If the heaps do not ferment, the process may be accelerated and assisted by watering them with the yard drainage, or with a solution of bones dissolved in sulphuric acid, and then covering them closely with earth or sods. Bleacher's lye and gas water have also been recommended for this purpose, and where they can either be cheaply or easily obtained, should be used. It frequently happens, however, that fermentation proceeds too rapidly for the purpose of the farmer, and thus some of the most valuable properties of the manure are lost, and the quantity also becomes seriously reduced. In such case the heaps should be immediately turned and mixed with mould, and this operation should be repeated often enough to prevent the fermenting process from ever proceeding farther than may be necessary for the destruction of the seeds of weeds, and the decomposition of the fibre of the vegetable matter contained in them. Where stable dung is used, it will generally be found that when the straw has become so far rotted as to admit of being cut through with a spade, it is fit to be carried upon the land, and if allowed to remain longer in the heap, its substance and value will daily diminish. From what some farmers call 'rotten dung,' all the fertilizing properties are so completely drained away, that it is of little other use than to loosen the soil and retain moisture."

"The following method of making dunghills, as practised in Middlesex, has a just claim on the attention of agriculturists. All the scraping of roads, mud of ditches and ponds, and top mould of gravel

pits, are spread in convenient spots as bottoms for dunghills. On these layers is carted all the dung produced on the farm, or which can be obtained from London, etc.; and to these are occasionally added chalk, ashes, soap boiler's rubbish, etc. In this state the heap continues till within a month of the time of manuring the land, when it is thoroughly turned, the clods broken, and the drier parts thrown into the centre."

"Mr. Thomson, of Kirby Hall, recommends, 'to have a pit dug in the earth, into which to throw manures; the bottom of the pit is water tight, and has a slope toward the centre, where a tank is placed so as to receive the drainings of the manure, which draining is frequently poured over the manure so as to keep up a regular but not excessive fermentation.' He has all the vegetable refuse of the farm spread over the bottom of the pit, and on this the manure is carted. When wanted for immediate use, the manure is lightly thrown together, and, after being soaked with the tank-liquor, covered with a thin layer of soil. If it is to be kept for six months or more, it must be pressed together, and thickly covered with soil or peat, so as almost entirely to exclude air."

"The most proper situations for dunghills are contiguous to stables, etc., to which may be added others near the house and piggery. The *dung moor* or pit adjacent to the house, may be composed of various ingredients besides dung. Scrapings of the yard, earth, straw, weeds, dung of fowls, soot, ashes, shells, lime and bones, kitchen sweepings, dirty water, suds, brine, urine, etc., etc., all contribute to its richness.

"The dung heap contiguous to the barn and outhouses, may be augmented by soil, mud, weeds, etc. In every case, however, it will be proper that those ingredients should predominate which are best calculated for the land in which it is to be laid, and which will ferment and decompose as nearly as possible at the same time; for otherwise, one portion may be losing its most valuable qualities, while another is only slowly proceeding towards decomposition, or the whole process may be improperly checked. The process of fermentation, however, will not take place so evenly and so rapidly as it ought, unless the heaps are shovelled over once or twice in the course of the summer, in order that the various ingredients may become more intimately mixed and mellowed."

"In the management of farm-yard manure, it is important to guard against its being exposed to the weather. The heap should be kept closely together, and the daily additions placed regularly upon it. Should no further addition be made to the heap before applying it, the whole may be covered with earth.

"But although exposure to the atmosphere is injurious, the access of water from the roofs of buildings, etc., is still more so, as directly carrying away the most important ingredients of the heap."

"When a mass of manure, however rich it may be, has remained for

a length of time saturated with moisture, it undergoes such a change that no management can induce fermentation, without the addition of fresh manure." On the other hand, want of moisture often induces an imperfect and destructive fermentation, highly injurious to the manure." Hence, if the manure heap is liable to become too wet, it may have a drain leading off to a tank or heap of muck, etc., at a lower level; and heaps of manure in dry situations may be much improved by having liquid matters poured over them.

"Fermentation being farther regulated by the facility of access to the mass, this may easily be regulated by compressing the materials, or placing them loosely together. Heaps formed in autumn or early winter, and not intended for application till spring, may be compressed by discharging the loads from the carts on the heap itself. This is effected by keeping one end low and sloping, and the compression by this means prevents the horses' feet and the cart wheels from sinking in the heap, the unloading on it being attended with much less difficulty than could be imagined by persons unaccustomed to the work. The degree of compression should be regulated by the quantity of manure and the length of time it is to remain. When it is not intended to remain long in the heap, no compression should be applied, but the mass placed together as loosely as circumstances will permit."

"In all cases, and under all systems, the objects to be kept in view are that no refuse—be it solid or fluid, animal, vegetable, or mineral,—should be wasted; that the fertilizing qualities of the manure should be as much concentrated and retained as possible; that the manure should be so made that it may be preserved as long or as short a time as may be requisite—and so combined and managed that, when applied, it shall be of that nature and in that condition which will best ameliorate the soil, and promote the vegetation of the crop for which it is destined."

(2.) *Judge Peters on Manures.*—"The first consideration in the management of manures is to secure them against all waste. On most of the farms in this Island the manure heaps are exposed to the rain, by which the most fertilizing parts are washed out, and frequently placed on the side of a hill, so that their dark, rich, juices—instead of being saved for the crop—run off to the nearest brook. This is a common error. To prevent it, the place where the manure is thrown out should be dug out so as to form a pit two, three, or four feet deep, according to its situation; if the bottom will not hold water, it should be puddled with clay; during the summer, or in the fall, as most convenient, one or two feet of bog mud, if it can be got, or earth from the road side, should be laid on the bottom of the pit—the manure, when thrown out, will then rest on this mud or earth, which will absorb the juices as they escape, and become as good manure as the dung itself: and what the mud or earth does not soak up, will remain in the pit

saturating the lower parts of the dung-heap. This will be found, on trial, an improvement on the present system. But there is a further improvement, viz.: the erection of a shed against the side of the stable or cattle-house over the pit, so as to cover the manure when thrown out; this will prevent its being mixed with snow in winter, or washed by rain in spring. It is of great importance in the management of barn-yard manure, that a *gentle* fermentation or heating should be constantly going on in the heap—first, because a certain extent of decomposition is necessary to render the litter it contains fit food for plants; secondly, because by this heating, seeds of noxious weeds are destroyed. If the dung is mixed with snow and frozen, no decomposition goes on in winter, and the seeds of every weed which grew on the farm are preserved and carried out with the manure, and are thus re-sown in the spring. By having the manure covered with a shed, this evil will be avoided, as—though ten or twelve inches of the top of heap thus covered may be frozen—yet, even in mid-winter, the interior of the heap will maintain sufficient heat to destroy the vitality of the seeds, and, gradually, to decompose the litter. If, on the other hand, manure which has not been covered, be left till late in the spring, the heat of the weather soon causes it to heat so rapidly, that it becomes too hot; a strong smell will be found coming from it. This is a gas called ammonia, which—though invisible—is the very best part of the manure, and, if preserved, would produce the farmer bushels of turnips, wheat and oats. On opening a heap which has undergone this excessive fermentation, a great part of it will often be found "fire-fanged,"—that is, having a dry, mouldy, appearance.—Manure reduced to this state is of little value; but where dung, by being under a shed, has undergone a gradual decomposition during the winter, this excessive heating, and consequent loss, will be avoided. Boussingault, page 260, on this subject, says:—

"The loss of ammonia from dung-heaps in the course of *regulated* fermentation, must not be estimated too highly: when the decomposition is *carefully* conducted, the loss is really very small, the gentle fermentation then raised has characters which differ essentially from those that accompany the rapid putrefaction, which never fails to take place when matters are not well managed. As an example of the rapid and injurious fermentation of which I speak, I may cite that which frequently takes place in piles of horse-dung. Every one must have seen such dung-hills left to themselves, acquiring a very intense heat in the course of a few days, and even heard of their taking fire. I have seen piles of this kind reduced to their mere earthly constituents; such are never the results of the moderate and gradual decomposition, which farm-yard dung ought never to exceed. When the pit or stance is emptied—in which a slow and equal fermentation has taken place—the upper layer is seen to be very nearly in the same state in which it was when it was piled, the layer immediently beneath this one

is changed in a greater degree, and sometimes exhales a slight, ammoniacal odor; in the lower strata the modification is yet greater; the straw has lost its consistency, it is fibrous, and breaks into pieces with the greatest ease; the mass is also proportionally darker in color as we go deeper, and—on the ground—is black. There is no doubt but that the state in which the properly managed dung heap is found in the end, is due to the circumstances in which it has been placed and kept during the whole time of its preparation; its constituent elements would have gone through a totally different course in the progress of their modification, had they been left exposed to the open air.'"

"The urine of cattle, horses, pigs, &c., is a most powerful manure."

"The urine saved from a single cow is considered worth ten dollars per annum in Flanders, where agricultural practice has reached a high state of advancement. The urine of a cow for a year will manure one and a quarter acres of land, and is more valuable than its dung in the ratio by bulk of seven to six, and, in real value, as two to one. How important, then, that every particle of it be carefully husbanded for the crops."—*Allans Farm Book, p.* 64. And yet this most valuable manure is very generally wasted in this Island. There are several methods of saving it. One generally practised is to excavate the earth under or near the stables or stalls, and place it in a tank, either made of wood or built of brick, and grouted so as to hold water—and from which the liquid is pumped into a puncheon placed in a cart, or on wheels, and then allow it to run off as the cart is driven over the fields; various contrivances being used to sprinkle the liquid evenly over the ground. A simple and effective one is to place a board in the tale of the cart, with notches cut in the under edge—by letting the liquid run from the puncheons into the cart, it will be equally distributed the width of the cart body, as it is driven along. But, as the construction of tanks requires an outlay of money, which many farmers cannot afford, a less expensive method seems better adapted to our circumstances. It has already been stated that a pit should be dug by the side of the stables, to receive mud or earth, on which the dung should be thrown. The urine is generally wasted by running through the loose floors of the stables. Now, suppose the cattle stand with their tails toward the pit, all the farmer has to do is to shelve off the earth from under the stable three or four feet, as far as the group extends, so that any liquid falling through will run into the pit. If the cattle stand in a double row, or tail to tail, then, under the whole of the group, a drain must be dug leading to the pit, as wide at the top as the group, and narrow at the bottom, and puddled with clay, so that the liquid falling through will gradually flow over the earth or mud placed in the pit; by this means the urine—instead of running under the barn and being lost, will be soaked up by the mud or earth in the pit. This method may be adopted even where the floors are

formed of logs. Those who can afford to have tight plank floors, will find it more convenient to let it empty into the pit from spouts under or over the sill, because, as the liquid should flow into it over the top of the mud or earth, the pit will then hold a sufficient quantity without being made so deep as it would require to be where the liquid first runs through the floor. By means similar to the above, the writer last year obtained 220 loads of manure from the urine of his stock—seven cows and three horses—independently of the manure made from their dung. The following extract from the *Farmer's Treasure*, page 175, both points out the mode of saving the urine, and strikingly illustrates its value as manure:—

"A letter from Charles Alexander, near Peebles, in Scotland, addressed to Sir John Sinclair, in 1812, contains much valuable information on this subject. This intelligent farmer had long been impressed with the great importance of the urine of cattle as a manure, and he set about to discover, by a long and well-conducted series of experiments, the best mode of collecting and applying it. He began by digging a pit contiguous to the feeding stall, but distinct altogether from that which was appropriated for the reception of the dung. The dimensions of the pit were thirty-six feet square, and four feet deep—surrounded on all sides by a wall—and the solid contents were 192 yards. Having selected the nearest spot where he could find loamy earth—and this he always took from the surface of some field under cultivation—he proceeded to fill it, and found that with three men and two horses, he could easily accomplish twenty-eight cubic yards per day. When the work was complete, he levelled the surface of the heap in a line with the sewer which conducted the urine from the interior of the building, on purpose that it might be distributed with regularity, and might saturate the whole, from top to bottom. The urine was supplied by fourteen cattle, kept there for five months on fodder and turnips. The contents of the pit produced 288 loads—allowing two cubic yards to be taken out in three carts—and he spread forty of these on each acre, so that this urine, in five months, produced a compost sufficient for the fertilization of seven acres of land."

He states, further, that he had *tried* this experiment for *ten years*, and had indiscriminately used—on the same field—either the cow dung or the saturated earth, and, in all stages of the crop, he had never been able to find any perceptible difference. But, what is still more wonderful, he found his compost lasted, in its effects, as many years as his best manure.

It appears, then, that in five months each cow discharges urine which, when absorbed by loam, furnishes manure of the richest quality and most durable effects, for half an acre of ground. The pit which contained all the dung of the fourteen cattle, as well as the litter employed in bedding them, and which was kept separate for the purpose of the experiment, only furnished—during the same period—240 loads, and these, at the same rate, could only manure six acres.

From these facts, it is evident that the urine which the farmers in this Island waste, is actually worth more than the dung which they save—a conclusion which should certainly lead to an alteration in their present practice.

The dung is often drawn out to the fields in March and April, and formed into heaps, where it remains until it is wanted. This is necessary to forward the spring's work; but it is generally left uncovered, and heats before it is carted out for spreading, and thus a great portion of the ammonia—the best of the manure—is lost. Agricola observes:—

"A skilful agriculturist would no more think of allowing a violent fermentation to be going on in his dunghill, unmixed with earth or matter to fix and secure the gas, than the distiller would suffer his apparatus to be set to work without surmounting his still with the worm, to cool and condense the rarified spirit which ascends in evaporation; in both, the most precious matter is that which escapes in a gaseous state; and to behold it escaping with unconcerned indifference, is a demonstration of the most profound ignorance."

The *Farmer's Treasure*, page 73, gives the following directions:—

"When it is found necessary to cart the manure away in order to forward the business of the season, previous to the commencement of the work, a quantity of peat or soil should be collected on the spot intended to receive the dung. The foundation of the heap should be laid with such material, about six or nine inches thick, according to the nature of the dung to be laid upon it, and it should be rather inclined to the centre, so as to retain as much as possible of the soakage of the heap—the sides should be kept upright, and the top level. At the conclusion of the hauling, the two ends should be brought up to the general level of the heap, and the whole surface—including the top, sides and ends—should be well coated with the mould, or other material provided for the purpose."

In this Island, the ground being frozen in March and part of April, earth or mud cannot then be got; but the farmer should look ahead—he can make a heap of mud or earth during the summer or autumn to cover his manure with in the spring; the heap should be placed in the lee of a bush or fence, where the snow accumulates, or surrounded with a few bushes or hurdles to catch the snow. I generally prepare a heap of bog mud in this way to cover my manure heaps in the spring; I find it then easily got at, as the frost seldom penetrates the heap more than five or six inches. This mud being coated twelve or sixteen inches thick over the sides and top of the dung heap, retains the ammonia, and becomes as good as the dung itself, and greatly increases the quantity of manure.

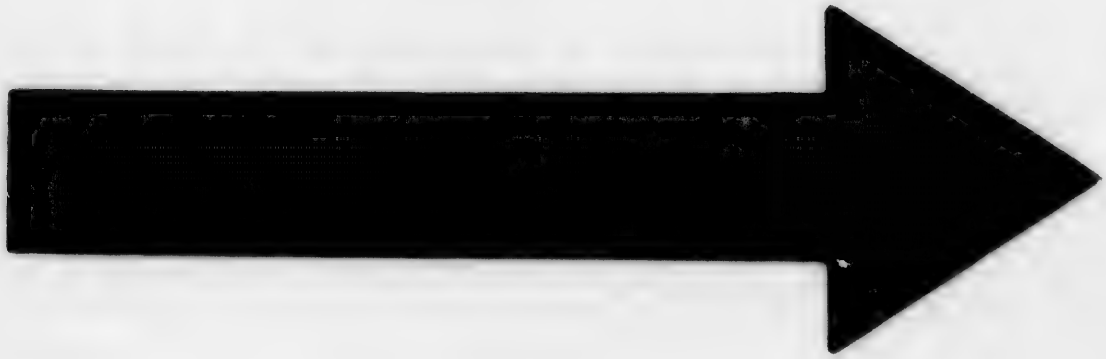
Whether the manure be spread over the ground to be ploughed, or put in drills, it should be covered as soon as possible after it is spread,

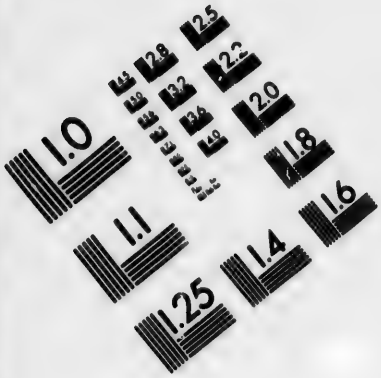
because by exposure to the sun, its moisture is evaporated, and the dung is left parched and dry, and does not rot so quickly in the soil as when it is ploughed in damp, consequently the crop remains a long time without receiving benefit from it. I frequently see dung spread two or three days before it is ploughed in. If it were old, well-rotted dung, it might not matter so much; but with half-rotted dung, made only the winter before, it is a most wasteful practice; correctly speaking, the plough should follow the spreaders; but our practice must be adapted to our circumstances; and few of our farmers can command sufficient hands to do this, but all should remember, "*that every instant it lies exposed to the air, it is losing its value*," and no one need spread more in the forenoon than he can cover before night.

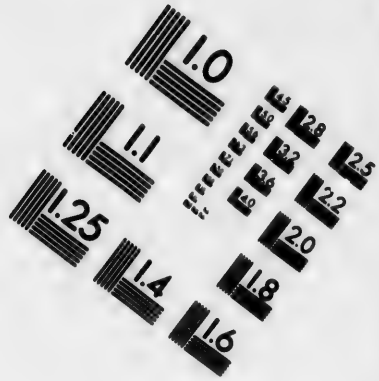
Bog Mud, of which there is abundance in this Island, is a most valuable manure, but very generally neglected; one frequently sees a farm poor and worn out, its owner complaining he cannot get manure, and yet in the midst of his worn out fields lies an acre, or half an acre, of mud, from two to five feet deep, containing manure sufficient to make the whole farm as rich as a garden, if he would but use it. An American Agriculturist, speaking of bogs and swamps, says:—"Such reservoirs of vegetable nutrition are mines of wealth to the farmer, if judiciously applied; nor can he justify meagre returns from his fields while this remedy is within his reach." This kind of mud frequently contains an acid quality, and then if spread and ploughed in fresh from the bog, it will be of little or no service to the first crop, and may prove injurious to it; yet, even then, in a year or two, its beneficial effects will be evident, and will be found durable.

But to make it produce prompt and immediate effect, it should be mixed with manure, or lime, or ashes, which may be done in various ways. In mixing it with manure, the plan I pursue—suggested to me by Fessenden's Complete Farmer—is this: I first form a bottom of mud fifteen feet wide and eight or ten inches deep; then lay on a layer of manure about six inches deep; then eight or ten inches of mud; then six inches of manure, and so on, alternate layers of mud and manure, till the heap is about four and a half feet high; the sides, ends and top are then coated with mud ten or twelve inches thick; the manure and mud should be thrown on from each side, and no one allowed to tread on the heap, because, if it is packed too closely, it will not heat so well. The dryer the mud the less manure will be required to cause the whole to heat. I generally make the compost in August or September, and use about one load of manure to three of mud; if not made up till October, I use a larger proportion of manure, as more is then required to produce heat than when the weather is hotter. Early in the spring the heap is turned; it then heats slightly again, and is ready for turnips or other crop, and a cart load of it will be found equal to a cart load of farm yard manure.

In mixing it with lime, I have found twenty barrels of roach lime







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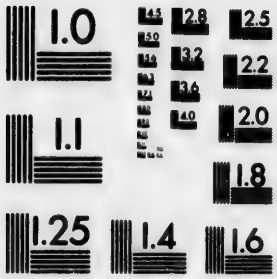

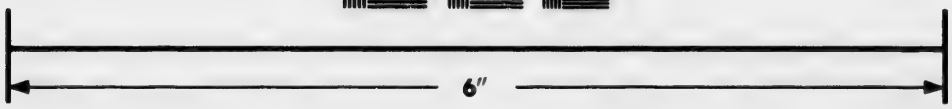

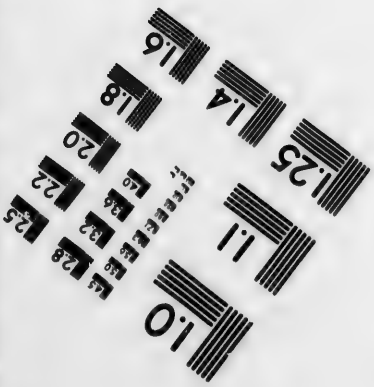

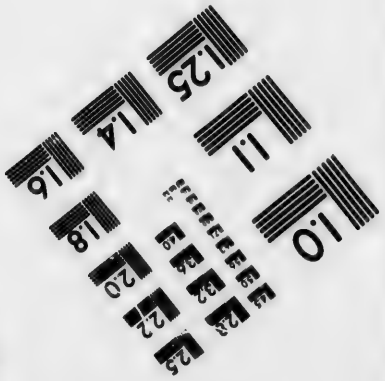

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sufficient for one hundred cart-loads of mud. The lime should be slacked beside the mud, and mixed with it while it is hot; it should remain a year in compost, and be two or three times turned.

Ashes serve the same purpose, and in many parts of the Island are more easily obtained than lime. Dr. Dana, of Massachusetts, recommends eight bushels of unleached wood ashes to be mixed with one cord of mud, which, he says, is equivalent to pure cow dung in value. I have found the following method of preparing this mud cheap and effective:—I draw out the mud and dump the loads near the bog, making the heap about thirty feet wide, leaving it just as it falls from the cart, without levelling; then haul the roots thrown out in digging the mud, and pile them on the heap; then haul out the moss which has been pulled off the bog in getting at the mud, and pile it on the heap over the roots; in this way it soon dries. I then burn it, and the ashes cover the mud; I then throw in about five feet from each side of the heap, and put on a fresh layer of mud; then pile on more roots and moss, and burn again, and so on, till the pile is as high as I wish it; then turn the whole, and let it lay over the winter. I have treated about five hundred loads of mud in this manner, which seems to me as good as that prepared with lime, while the cost of the lime is saved.

Spreading this mud in the barn yard, or cattle pen, where it receives the droppings, and is trodden by the cattle, is also a good mode of preparing it; but then it is advisable to make it up in a heap for a month or two before it is used, that it may heat.

(3.) *Agricola on Manures.*—"When a country advances, in the progress of improvement, from pasturage to tillage, the various sources of manure are investigated and sought after with an avidity commensurate to the fervent spirit of enterprize. The attention which is paid to this branch of management, indicates with certainty the state of the art; and, wherever we discover little or no exertions made in it, in order to accumulate, by artificial means, the aggregate heap beyond the ordinary supply, no further proof is requisite of the state of debasement in which agriculture lies. On the other hand, when a vigilant and persevering industry is ever on the alert; when numerous expedients are tried to enlarge the quantity as well as to improve the quality of manures; when composts—diversified both in the ingredients and proportions—become objects of curiosity and experiment; these are the first symptoms of returning life and vigor, and may be hailed as the precursors of more flattering and auspicious prospects. The ardor of agricultural pursuit in England was ushered in by these beginnings—and, at the present day, there is no subject of more paramount interest than the augmentation of the dung-hill. Every kingdom of nature has been ransacked, to find out substances endowed with the principle of fertility; science has come in to the assistance of art; philosophy

has stooped from her dignity, and joined in the general research; and the public interest—instead of having flagged with the very ample success which hitherto has attended the inquiry—has only been roused to more spirited and adventurous efforts. The COMPOST MIDDENS of Lord Meadowbank, the mixture of the soil with decomposable matter, the universal application of lime, and the late introduction of burnt clay, are steps in that great race in which all men—as if stimulated by one common impulse—seem to have engaged. Indeed, unless other means are resorted to in order to replenish the waste of vegetation than the simple contents of the barnyard, Great Britain could not sustain the half of her population, nor draw from her own territorial domains that exhaustless abundance which provides materials for her commerce, and ministers to the necessities, comforts, and luxuries of life. This exuberance of supply may all be traced to the improved and skilful methods, not of cultivation so much as of multiplying the efficacy of putrescible manures. There was a period in her history when, like this Province, she was more "a grazing than a corn country;" and when butcher-meat bore no sort of relation in price to wheat and other grain. When we review this part of her history, we are struck with the palpable blunders she once committed, and trace—between them and our own—a striking and remarkable analogy. The manures then in use were the simple excrementitious matter of the cattle on the farm, unaided by those compound ingredients which have been since introduced, and which may be considered in the light of the raw materials from which the modern stores are manufactured. In truth, without great attention to the artificial increase of this necessary article, our agriculture can never rise to any importance; and it would be in vain to urge the extended culture of white crops, unless we possess the means of repairing the exhaustion of the soil. It has been long acted on in Flanders, and is now universally acknowledged in England, that an arable farm may be kept in good heart, and subjected to a continued course of cropping, without any extraneous dung, other than what is made on the premises, from the consumption of green crops, straw and fodder. The cattle which are fed on turnips—the horses employed in labor—the pigs and poultry—are perfectly sufficient to supply such a quantity, under the direction of a scientific manager, as will annually restore to the land that richness of which it is deprived; and at the same time admit the grain to be carried to market, to meet the wants of the community. Every spot, in both countries, can be made to repair its own waste; and the luxuriance of one is never employed to correct the poverty of another. Here our rich marshes and intervales are taxed, and, as it were, laid under contribution, for the benefit and support of our uplands.

In the further prosecution of this subject, I shall point out some capital errors in the management of manure, which prevail, with few exceptions, throughout the whole province, and which have a most

pernicious influence on our agricultural progression; and I shall prescribe the remedies which the case suggests, and which are practicable under existing circumstances.

I observe in the first place, that we have almost no pits dug upon a regular plan for the collection and preservation of the dung, which from time to time is wheeled out of the barn. Sometimes it is spread out on the green sward; sometimes cast carelessly in a court, or adjoining yard; but seldom in an excavation made purposely for retaining the juices which run from it. These are suffered either to stream along the surface or sink into the earth; and in both cases their utility is sacrificed to inattention and ignorance. This is no more, however, than half of the evil. The exhalations which arise from the ardent influence of a summer's sun, and from the natural activity of fermentation, are permitted to escape freely, and to carry along with them all the strength and substance of the putrescible matter. No means are taken to fix the gases which are generated, and which constitute the elements of vegetable food. I do not know if there be one solitary instance throughout the wide range of the province, of the application of soil on the surface of a dung hill, to prevent this unpardonable waste and dissipation; and I am too confident, there is none, of lining the bottom with a regular coat or layer, to imbibe the nutritive moisture. The dung, too, is suffered to rot without any attention whatever to the degree of heat; and I should startle my readers, were I to tell them that the fermentation should never be urged beyond 100° of Fahrenheit's thermometer. At a much lower heat, carbonic acid, carburetted hydrogen, and the other gases of that family, ascend as elastic fluids, and are diffused and lost in the atmosphere. The dung-hill becomes what is called FIRE-FANGED, and the principles of fertility are expelled by the action of those chemical laws which regulate and pervade the minute and subtle particles of matter.

If the dung be injudiciously treated, the urine discharged by the cattle is squandered, and indeed altogether lost. This is owing to the construction of the barns which generally prevails throughout the province, and which cannot be altered without some little outlay of capital. Being formed of wood, they are mostly raised and propped on a foundation; and a floor of plank is invariably laid. The whole urine of the cattle, except what is absorbed by the dung, finds its way through the seams, and either oozes into the earth, or forms beneath the barn a fetid and noisome pool of standing water. The essential elements of vegetable matter with which it is surcharged, assume quickly the gaseous form, and either mount up through the floor or escape by the sides of the building. At all events, their fertilizing qualities are turned to no account, and the loss, from this single circumstance, is ruinous beyond calculation. It may be necessary, in some measure, to ascertain the amount of this mischief, that we may set about correcting an evil of such formidable magnitude, with a

vigorous and resolute energy. I should be afraid to hazard my character with the public, by stating in round and unqualified language, the value of this rich juice which is literally wasted, and thrown away; and, therefore, I shall proceed with caution, and give a detail of facts,—conclusive in their bearings—and substantiated by the best authority. They are contained in a letter* from Charles Alexander, near Peebles, in Scotland, and are addressed to Sir John Sinclair, in 1812, for publication. This intelligent farmer had long been impressed with the great importance of the urine of cattle as a manure; and he set about to discover, by a long and well conducted series of experiments, the best method of collecting and applying it. He began, by digging a pit contiguous to the feeding stall, but distinct altogether from that which was appropriated for the reception of dung. The dimensions of this pit, according to his own account, were 36 feet square and 4 feet deep, surrounded on all sides by a wall; and the solid contents were 192 yards. Having selected the nearest spot where he could find loamy earth, and this he always took from the surface of some field under cultivation, he proceeded to fill it, and found that, with three men and two horses, he could easily accomplish 28 cubic yards per day; and the whole expense of transporting the earth did not exceed £4 16s. When the work was complete, he levelled the surface of the heap, in a line with the mouth of the sewer, which conducted the urine from the interior of the building, on purpose that it might be distributed with regularity, and might saturate the whole from top to bottom. The quantity conveyed to it, he estimates at about 800 gallons; but as this calculation was founded partly on conjecture, for he measured not the liquor, it will be better and more instructive to furnish and proceed on data, that are certain and incontrovertible. The urine was supplied by 14 cattle, weighing about 34 stone each, and kept there for five months on fodder and turnips. The contents of the pit produced 288 loads, allowing two cubic yards to be taken out in 3 carts; and he spread 40 of these on each acre, so that this urine in five months, and from fourteen cattle, produced a compost sufficient for the fertilization of seven acres of land. He states further, that he had tried this experiment for ten years, and had indiscriminately used in the same field either the rotted cow dung or the saturated earth; and in all the stages of the crop, he had never been able to discover any perceptible difference. But what is still more wonderful, he found that his compost lasted in its effects as many years as his best putrescent manure; and he therefore boldly avers, that a load of each is of equivalent value. Conclusions of vast importance are deducible from this statement, and I cannot resist the feeling of placing them in a strong and advantageous light. They speak a volume of instruction; and if we are willing to learn, they must lead to a very material alteration in the

* Farmer's Magazine, vol. 13, p. 78.

construction of our barns. It appears, then, that in five months each cow discharges urine which, when absorbed by loam, furnishes manure of the richest quality, and most durable effects, for half an acre of ground. The dung pit, which contained all the excrementitious matter of the 14 cattle, as well as the litter emp'oyed in bedding them, and which was kept separate for the purpose of the experiment, only furnished during the same period 240 loads, and these, at the same rate, could only manure six acres. The aggregate value of the urine, therefore, when compared with that of the dung, was in the ratio of 7 to 6; so that we are borne out by these premises in this extraordinary inference, that the putrescible liquor which in this province, and under the management of our farmers, is wasted and annihilated as far as regards any useful purpose, is intrinsically worth more than the dung, as an efficacious and permanent dressing; and if we take into consideration that this latter manure is not treated with any skill and judgment, it will not seem surprising that the culture of white crops has never been carried here to any extent since we have despised and neglected the only means of creating them.

These defects call aloud for amendment. No country is entitled to be styled agricultural, where the fundamental maxims of the science are so outrageously violated, and where the prevailing practice sets at naught the simplest rules of the art. Grazing draws forth no energies of the mind; it is compatible with indolence, stupidity, and a gross ignorance of all principle; the Arab in the desert can tend his flocks and herds, and leave their multiplication to the instinctive appetites of nature; it is only the first step from the savage life, and, in place of hunting for the prey which he devours, man tames and domesticates the lower animals, but leaves their increase, their subsistence, their diseases, to the unguided agency of natural causes. 'Tis the plough which awakes his dormant faculties, and stimulates to industry. Like the Sovereign of the Creation—he commands, and is obeyed; he speaks, and it is done. The weeds, which are the natural inmates of the soil, disappear at his bidding; the grasses spring up, and form a carpet for his feet; the corns are subjected to his power, and wave their loaded ear around his dwelling; the forest gives up its fruit trees, to load his table with their luscious products; and the features of a rugged and forbidding territory are transmuted into the beautiful and sublime, and soften under the influence of his transforming smile. This Province it still in a rude and unsubdued state; and its husbandry partakes of its general character. For this, it is not difficult to account. Emigrants of all trades, of all habits, and of all ranks of society, land on this foreign strand in quest of subsistence. Manufactures are the offspring of civilization, and of the accumulation of wealth; and cannot find their way but into an old country, abounding with resources and population. Here we have none, and cannot have them for a century. The unfortunate stranger—driven from the only

stay on which his hope rested—seeks refuge from despair by plunging into the forest and cultivating the soil, to answer the cravings of indignant nature. Without skill, without capital, without the benefit of instruction, he becomes a self taught farmer, ready to run into every blunder which ignorance has invented, and to which the vicious culture of the country has lent the sanction of authority. His hut, his barn, his implements of husbandry, his seed, his stock, are all chosen without knowledge, and continued in use without the least exercise of the understanding. He has no landlord to exact a rent; no government to levy taxes; no rival to animate industry. He soon rises above want; the spontaneous productions of the soil yield him a scanty subsistence; the luxuries of life are seen only at a dim and indistinct distance; and his faculties, thus lulled asleep by surrounding circumstances, fall into a state of torpid lethargy. He must be stirred up, aroused, and forced into action. This is the province of superior and exalted characters, who, from their elevated rank in society, preside over his destiny. To them a rich reward of gratitude is due; and their memory shall descend to posterity embalmed by the blessings of a present generation. We are approaching an eventful epoch; the public attention is excited; we are prepared to count over the catalogue of our past errors; we are panting after knowledge; and a new age—full of promise and pregnant with improvement—is arising on our desolate and forlorn prospects.

During this state of public feeling, the evils which I have pointed out in our treatment of decomposable manures, cannot long remain without correction. The remedies are not only simple, but accessible to every farmer of moderate capital; and the whole expense of the improvement will be compensated by the first, or at most, the second year's saving.

1st. With respect to the formation of a dung pit, I would recommend that a place be chosen near the barn, which should be dug about three feet deep, and of a size proportionate to the stock of cattle usually kept by the farmer. It is not necessary that it should be built round with a wall, or have a perpendicular descent, as it may slope gently inwards, and deepen gradually towards the centre. After it is thus hollowed out, the texture of the bottom should be examined, and if found firm, impervious, and capable of containing the juices, no further trouble is requisite, and the work is complete; but, if open and porous, it should be coated with clay, and lined with large and coarse flags. Into this pit, earth from some neighboring field, should be first brought and strewed over the bottom and sloping sides, to the thickness of from 9 to 12 inches. Thus a safe depository will be prepared for the cleanings of the barn, for waste straw and weeds, for the sweepings of the kitchen, for the stems of peas, beans, cabbages, potatoes, and in short all vegetable matter of woody fibre, as well as for the dung of the feeding cattle. After a complete layer of putrescible

matter has been spread all over, and when the symptoms of an active fermentation have become visible, the earth, which was thrown out of the excavation, may be slowly returned and scattered on the surface of the heap, to catch the exhalations which are ascending. Hither, too, the urine should either be conducted by a drain, or carried by buckets; for it is an unpardonable waste to lose the benefit of this rich invigorating manure. The earth which lies at the bottom will greedily drink up the urine and the vegetable juices, and thus gain a large accession of nutriment and value. So soon as the pit is filled up in the manner herein described, it should be emptied of all its contents; and these should be carted to the field where they are meant to be afterwards applied, and there laid down in some convenient corner, to be mixed up and sorted into a profitable compost. The pit, adjoining the barn, may be again lined with mould, and the former operations repeated in procuring and augmenting its contents.

According to this plan, every farmer, at the first opening of next spring, should cart out his dung, and form it at once into a composite pile, which, if skilfully managed, will gather heat, and undergo the process of fermentation before it will be needed in seed time. He should then instantly set about the digging of his pit, and the other alterations on the barn which are indispensable to the successful collection and preservation of his future manure. During summer this pit should be emptied twice or thrice according to circumstances; and its fermentable and earthy materials transported to the ground which they are destined to fertilize, and there subjected to a new process. Towards the fall, which by its length and mildness makes amends for the advantages of more favoured regions, all those compost heaps as well as the dung about the barnyard, should be spread on the land, which is meant to be immediately ploughed. In the mean while, an additional stratum of mould should be distributed along the bottom and sides of the pit before the approach of winter, and during that rigid season the dung may be accumulated without any extraordinary care, as the intensity of the cold is unfavorable to putrefaction, and little loss will be sustained from the dissipation of the gaseous matter. Such farmers as may choose to take the trouble, and have suitable convenience of covered sheds, may pile up beforehand a quantity of dry earth, which may be scattered over the dunghill in the depth of winter, on such places as indicate a strong fermentation.

2nd. These remarks and general reasonings will have prepared my readers for the sentiments I must express regarding the construction of our barn floors. They are the objects of my unqualified condemnation as an agriculturist, of my sincere regret as a friend of the country, and of bitter and deep bewailing as the anxious promoter of our future and rapid advancement. Reform here cannot be effected without considerable cost; and I anticipate adherence to existing errors, notwithstanding the soundness of the conclusions, and the

manifest utility of a change. I must, however, cling to the hope of receiving at least a limited and partial obedience; and I request my well-wishers, who have animated me in my course, and borne up my spirits in the midst of difficulties, to listen to the call, and set the first yielding example. The increase of valuable manure will be incalculably great; and the solid benefits will vastly outweigh the trouble and expense. I see only one plan by which this evil may be effectually obviated; but as there is a choice in the materials to be employed, such may be selected as are most accessible in any particular district. After tearing up the planks, and building the foundation round and round close to the sills, the void space below the flooring should then be filled and packed firm with earth. As there will be a necessity to cut away all the present sleepers or joists, which, besides supporting the planks, bind and unite the two sides of the frame, pieces of square timber may be stretched across the whole breadth and at a lower depth, and be secured to the bottom of the sills, either by a mortise, or by driving down a round iron bolt. By this means the strength of the frame will be preserved unimpaired; and the operations may proceed without endangering the structure. The earth should then be filled in, till it rises to the level of the present floor, and it should be beaten down by a heavy mallet, till it is completely consolidated. A stratum of clay should be next laid over the whole surface, by which the moisture may be retained and hindered from escaping through the earth.

After dividing the interior into its respective compartments, the arrangements must proceed according to the use for which each part is designed. The stalls for the horses and cattle claim a distinguished share of attention. The fore feet of the animal should stand on higher ground than the hind, and there should be in every stall a gradual declivity backward, terminating in a gutter, in order to carry off all liquid matter. To this gutter an easy descent should be given outward, that all the urine may flow towards the pit on the outside of the building, which I have described as the great reservoir of this putrescible stream. The floor of each separate stall, as well as the gutter, may be laid with plank while the clay is soft and yielding, and every seam and interstice may be closed up by the same substance. These planks, thus pressed and imbedded in the clay, may be nailed and secured to transverse beams running along the length of the barn, and so adjusted as to preserve a sloping direction in the feeding stalls and gutter. But in every case where stones are within the reach of the farmer, they are decidedly superior in firmness, durability and usefulness; and paving the floor with them, although perhaps a little more expensive in the first instance, will in the end much better answer his expectations. The stalls should be laid with them exactly in the manner in which Water-street here has been lately improved; and the gutter may be formed either of similar materials, or preferably of smooth flag stones, like those our foot pavements.

The adoption of these improvements in the disposition of our barns will give a mighty impulse to agriculture; the urine and vegetable juices, which are now lost and dissipated, would multiply the powers of fertility; and the extended cultivation of white crops from the wonderful increase of putrescent manure, would be propelled with a celerity proportioned to the ardent hopes of the country."

"Young, in his letters of Agricola, was the first writer who directed the attention of farmers in this province to the use of *peat* or swamp muck in the preservation of composts. His method, which has been successfully practised by many farmers, well deserves to be republished.

"It would be unjust to deprive Lord Meadowbank of the well-earned honour of having been the first who investigated and ascertained, on scientific principles, the immense value of this species of manure. That learned judge, perceiving that the peat was entirely composed of vegetable substances endowed with an antiseptic virtue, or "a capacity of resisting putrefaction," instituted a philosophical inquiry into the nature of this singular quality, and the manner in which it might be overcome. From his extensive chemical knowledge, and his diligent and painful researches, he found that this antiseptic power owed its origin to the acids, and the astringent principle of tan; and as these were reduced, in succulent and fresh vegetables, by the hot fermentation to which they were exposed in the full career of putrefaction, he wisely concluded that the same cause would produce in peat the same effects. After varying his experiments in the course of six years, he published the results in a pamphlet, which he distributed gratis, and thus acquired to himself an immortal name in the records of Scotch Agriculture. The compost middens of Lord Meadowbank will be known and recollected by the latest posterity, when the decisions which he passed on the Bench, of which he was the prop and ornament, shall have worn away by the corrosive touch of oblivion. The peat to be used, according to his lordship's directions, may be taken, either from the top or bottom of the bog; but the turfy parts ought to be laid aside, as most unsuitable for the operation. After being thrown out of the pit, it should lie for some weeks till drained of its moisture, and then be transported to the field where the compost midden is to be formed. The proportion of the ingredients should be one ton of dung to three of moss; but although these were the proper quantities with the materials which his lordship employed, it has been found from experience that other proportions may be safely and judiciously adopted. In fact, the mixture should depend on the nature both of the dung and peat which are to be compounded. Horse dung produces a more violent fermentation than that of cows, and will therefore suffice to decompose a larger quantity; and its power in this respect will also be regulated by its own stage of putrefaction: for, if fresh, the heat will be more rapid and

much stronger than if old and rotten. The nature of the peat, too, must also be taken into account in assorting the ingredients. Some is a pure vegetable body, free of extraneous matter, from its being formed on an elevated situation; other, again, contains a mixture of earth, which renders it brittle, inadhesive, and putrescible; because it has originated in a patch of low land, or in the corner of some meadow, liable to be occasionally overflown from the high grounds. When it accumulates in such hollows, its texture is broken by the primitive earths suspended in the turbid waters, with which it is flooded; and in place of exhibiting a matted and organic structure, it resembles the consistence of paste, and is more fluid than a solid body. Such peaty matter may at once be carted to the arable field, and used as a manure without any preparation; and if thrown into a compost *midden*, six loads of it will be easily fermented with one of dung.

But peat is not generally of this character; and rules of composting must be laid down as applicable to this substance, commonly found of a tough and indestructible contexture. As soon as it is dug from the pit it should be spread out to dry, but not to harden in the sun; for if, by exposure to drought, it changes into a firm, adhesive lump, fit for fuel, it is almost impossible, by any known means, to induce afterwards the putrefactive process. When it is, therefore, about half dry, it should be carried to the midden, and first of all laid regularly along the bottom six inches deep, to constitute the first stratum. This should be succeeded by ten inches of dung. then six of moss, four of dung, and so on, till the latter is exhausted. Above the whole, a layer of moss should be spread to raise the midden to the height of four feet; and all the materials, from the very beginning, should be piled up in the loosest state, to encourage an incipient fermentation, which comes on, sooner or later, according to the state of the weather, and that of the component parts. It is at this time that the principal skill and care of the operator are called for, to mark and ascertain the progress of the compost; for so soon as it approaches to blood heat, it ought to be watered and turned over, with a new mixture of grass, to prevent the dissipation of the useful gases. After the temperature has subsided, the whole mass should be broken up, commencing at the one end, chopping with the spade all the bulky materials, and mixing them in the most perfect manner. A new hill, exactly resembling the last, should be formed on the same principles, either adding moss or dung as the state of the fermentation indicates; and after a second heat has been generated, which in a few days will become apparent, the heap should be suffered to cool, and it will be instantly ready to apply to the ground; but the longer it remains in the midden, the decomposition will be more perfectly effected, and the elementary principles of vegetation more freely disengaged. In summer, the whole preparation may be finished in eight or ten weeks; but in win-

ter, no injury will be sustained by keeping the materials in compost till the opening of the spring. Three tons of moss to one of dung would in this country, I fear, form an unfermentable compound, from the superabundance of cow-excrement, which is of a cooling nature, and less liable to violent heat; and on that account I would depart a little from the ordinary rule, and recommend two loads of dung to five of moss, which I do with some diffidence, as I am not in possession of any experiment of the kind that has been tried in this province, although it is clearly deducible from the principles laid down. It cannot, however, be a difficult task to discover the just proportions of the ingredients, as the process itself will soon teach an attentive observer, and lead him infallibly to the proper mixture. He has, on the one hand, to guard against excessive heat, which can always be checked by adding peat; and on the other, to bring on an active fermentation, which can be accomplished by enlarging the quantity of dung. A slight experience will very soon instruct our farmers in the due medium; and as I have been at pains to set forth the governing principles of the art, the plainest dictates of the understanding will be a sufficient guide in all cases of composting.

It will not, I believe, be unacceptable to my readers to insert here an extract from the small treatise of the learned judge, which was printed and distributed very extensively for behoof of the Scottish peasantry; and I do this the rather, because the subject, on account of its novelty and repugnance to common ideas, may be received with some distrust, unless conveyed in the very words of the author.

'Let the peat moss, of which compost is to be formed, be thrown out of the pit for some weeks or months, in order to lose its redundant moisture. By this means, it is rendered the lighter to carry, and less compact and weighty, when made up with fresh dung, for fermentation; and accordingly, less dung is required for the purpose than if the preparation is made with peat taken recently from the pit. The peat taken from near the surface, or at a considerable depth, answers equally well; and the more compact the peat, and the fitter to prove good fuel, so much the more promising it is to be prepared for manure.

'Take the peat moss to a dry spot, convenient for constructing a dunghill, to serve the field to be manured. Lay the cart loads of it in two rows, and of the dung in a row betwixt them. The dung thus lies on the area of the compost dung hill, and the rows of peat should be near enough each other that workmen in making up the compost may be able to throw them together by the spade. In making up, let the workmen begin at one end; and, at the extremity of the row of dung, (which should not extend quite so far at the end as the rows of peat on each side of it do,) let them lay a bottom of peat, six inches deep and fifteen feet wide. Then throw forward, and lay about ten inches of dung above the bottom of peat; then four or five of dung;

and then cover it over with peat at the end where it was begun, at the two sides, and above. The compost should not be raised above four feet and a half high, otherwise it is apt to press too heavily on the under parts, and check the fermentation: unless the peat, when dry, be very puffy and light, and then a much greater height is desirable. Neither should it be much lower, otherwise it will prove wanting in the compactness, and soon also, if the weather is very dry, in the moisture required for the ingredients of which it consists, to act chemically on each other. When a beginning is thus made, the workmen will proceed working backwards, and adding to the column of compost, as they are furnished with the three rows of materials, directed to be laid down for them. They must take care not to tread on the compost, render it too compact; and of consequence, in proportion as the peat is wet, it should be made up in lumps, and not much mashed or broken.

'In mild weather, seven cart loads of common farm-yard dung, tolerably fresh made, is sufficient for twenty-one cart-loads of peat moss; but in cold weather, a larger proportion of dung is desirable; at least it is prudent to omit putting any peat between the two upper layers of dung, and rather thicken the outer coat with peat. It is also proper, in winter, if ground with a dry bottom can be conveniently employed for the purpose, to increase greatly the breadth of the dunghill, which, in that case, may be done without any limit, by adding all round the dunghill circles, consisting of layers of dung and peat of seven feet in breadth. And if the mass of the dunghill is thus enlarged, there is little occasion to exceed the proportion of dung recommended for making up to prepare in the milder season, especially if a covering of coarse vegetables of any sort, such as waste hay or straw, rushes, broom, or furze, or brushwood of evergreens, is thrown over the dunghill. In fact, a covering of this sort is scarce less useful in summer to prevent the escape of moisture, than in winter to exclude cold.

'To every twenty-eight cart-loads of the compost, when made up, it is of use to throw on above it a cart-load of ashes, either made from coal, peat, or wood; or, if these cannot be had, half the quantity of slacked lime may be used, the more finely powdered the better. But these additions are nowise essential to the general success of the compost, provided a sufficiency of time is allowed to the preparation to compensate for the want of them.

'The dung to be used should either have been recently made, or kept fresh by compression; as by the treading of cattle or swine, or by carts passing over it. And if there is little or no litter in it, a smaller quantity will serve, provided any spongy vegetable matter is added at making up the compost, as fresh weeds, the rubbish of a stack-yard, potatoe-shaws, sawings of timber, etc. And as some sorts of dung, even when fresh, are more advanced in decomposition than

others, it is material to attend to this; for a much less proportion of such dung, especially if abounding in animal matter, as is less advanced, will serve for the compost, provided care is taken to keep the mass sufficiently open, either by a mixture of the above-mentioned substances, or, if these are wanting, by adding the peat piece-meal, that is, first making it up in the usual proportion of three to one of dung, and then, after a time, adding an equal quantity, more or less, of peat. The dung of this character, of greatest quantity, is shamble-dung, with which, under the above precautions, six times the quantity of peat, or more, may be prepared. The same holds as to pigeon-dung, and other fowl-dung; and to a certain extent also as to that which is collected from towns, and made by animals that feed on grains, refuse of distilleries, etc.

'The compost, after it is made up, gets into a general heat sooner or later, according to the weather, and the condition of the dung; in summer, in ten days or sooner; in winter, not perhaps for many weeks, if the cold is severe. It always, however, has been found to come on at last, and in summer it sometimes rises so high as to be mischievous, by consuming the materials, (fire-fanging.) In that season, a stick should be kept in it in different parts, to pull out and feel now and then; for if it approaches to blood heat, it should either be watered or turned over; and on such an occasion, advantage may be taken to mix it with a little fresh peat.* The heat subsides after a time, and with great variety, according to the weather, the dung, and the perfection of the making up of the compost; which then may be allowed to remain untouched, until within three or four weeks of using, when it should be turned over, upside down, and outside in, and all lumps broken: then it comes into a second heat, but soon cools and is fit to be taken out for use. In this state the whole, except bits of the old decayed wood, appears a black free mass, and spreads like garden-mould. Use it weight for weight, as farm-yard dung, and it will be found, in a course of cropping, fully to stand the comparison.'

Hitherto I have treated the subject as if excrementitious matter alone possessed the power of effecting and accelerating the putrefaction of moss; and it was this view which Lord Meadowbank chie / impressed at first on the public attention; but many other substances, he afterwards discovered, are endowed with this same capacity. Here my general theory of putrescent manures receives a collateral and happy confirmation; for it is now found, from a thousand repeated trials, that all animal and vegetable substances which are capable of being converted by decomposition into the food of plants, are also capable of operating on peat earth, of dissolving the charm of its

*In June, 1796, a compost was formed only 2¾ peat to 1 dung; it heated in July beyond the measure of a thermometer graduated at 110°. Part was allowed to stand, part turned over with a half more moss. Three weeks after (18th August) the heat of the former had descended to 84°, while that of the latter had got to above 110°.

incorruptibility, of expelling its poisonous and antiseptic qualities, and of transmuting it in a most efficient manner. Hence putrid water, the juices of the dunghill, the expressions of the cheese-press, the washings of milk vessels, soap suds, the oils and juices of green flax, urine of all descriptions, succulent vegetables and weeds, dead animal bodies, refuse of fish, night soil, sea weed, are all invested with the property of generating heat, and assisting the fermentation of peat; and composts may be formed with all these different ingredients. The carcass of a dead horse which is often suffered to pollute the air by its noxious effluvia, has been happily employed in decomposing twenty tons of peat earth, and transforming it into the most enriching manure. This wonderful discovery has exalted the swamps and fens into some degree of agricultural importance; and promises a new era in the multiplication and production of white crops. The fertilizing virtue of dung is increased quadruple by blending it with this inert matter; and Lord Meadowbank, after a long and watchful experience, declares that the powers and duration of this species of compost, in every diversity of soil, have given returns no wise inferior to the best barn-yard dung applied in the same quantity, and states expressly that it is equal, if not preferable, in its effects for the first three years, and decidedly superior afterwards.

There are several other views of this subject highly interesting to the farming class, upon which I dare not at present enter, as my letters on putrescent manures have already swollen much beyond my orginal limits, and I must leave the additional matter to some future day, when I may retrace this path of inquiry. I shall deduce one or two practical observations.

1. In a country like this, where there are no large towns, except the capital, whence the farmer can draw manure, our swamps and bogs offer an inexhaustible supply of this useful and indispensable article. Compost middens form an object of prime importance; and wherever they have been adopted as part of farm management, they have been followed by results of a most flattering and profitable nature. They tended to multiply the productions of the earth, to elevate the hopes of the husbandman, and to give a new impulse to his useful labors. Here they would not only be productive of all these effects, but they would arrest the progress of our morasses, by subjecting them to a waste gradual and constant; and they would introduce our farmers to an acquaintance with more successful modes of augmenting manure, so essential to the extended cultivation of white crops.

2. According to the practices which have obtained in this Province, we have not above one ton of manure applied to our fields for ten which, from the same stock of cattle, are produced in England; and of course we are not able to cultivate here, with the same means, above one acre in ten which are there under the plough. To such as have given due attention to the previous details, this conclusion, which

looks so violent and extravagant, can be established by the most ample evidence; and is quite irrefragable, without denying the premises which have been built both on facts and philosophy. First of all, the one half of our putrescible matter is lost entirely by the waste of the urine; and the other half—the dung—is grossly mismanaged either by the escape of the rich nutritive juices from the dunghill, or by suffering the putrefactive process to be carried to an extreme length. This is not all: that dung, if composted with peat, would in most cases be augmented four fold; and the quality and duration of the mixture are superior, at all events equal, to the principal original compound. Four tons of manure, then, may be produced from one of dung, and four tons also may be formed from the urine discharged by the cattle in the same given time. In a course of experiments by James Arbuthnot, Peterhead, he found 'that 300 cart loads of moss could be decomposed by drenching it with 440 gallons of cattle urine. The foundation of the dunghill was laid one foot deep with moss, and 150 gallons of the liquor thrown upon it. The fermentation came on instantaneously, attended with a hissing noise; the other two layers were then put on, the one after the other, sprinkled each with the urine, and the same effect was produced. Eight days after the midden was turned, and to all appearance super-alkalized.'* It would seem then that both the urine and dung, discharged in any given time, are of equivalent value; that each of them, if separately applied to peat, or moss, as it is expressed by Scotch writers, would prepare a quadruple amount of rich and valuable manure, and consequently, as the one here is lost from the construction of our barns, a load of dung is all we have for eight of compost, which could be produced from the combined efficacy of urine and excrementitious matter.

If we take further into account the putrefactive qualities of seaweed, of dead bodies, either horses, cows, or sheep, of common weeds, and of many other substances; I say, if we take into account the power of these in decomposing peat-earth, my general statement will not appear exaggerated, that in this Province we have not above one load in ten, which might be procured to replenish the exhausted energies of vegetation. But taking it for granted that, with a view to strengthen my argument, I have magnified the amount of our loss, and that we could only increase our manures six times above the present quantity, this concession calls loudly for reform, and explains, to the satisfaction of every common understanding, the mystery of our agricultural poverty. We fling away contemptuously the blessings of Nature and of Providence, and instead of blaming our own ignorance and neglect, we curse the climate and the soil, sit down contented with our present dependent situation, and despair of elevating that country on which we tread, and which imparts to us the pleasures of existence, to its proper rank in the scale of national importance."

Farmer's Magazine, vol. 16, p. 428.

CHAPTER XII.

ORCHARD AND GARDEN FRUIT.

Orchard Culture.

The culture of fruit trees is largely and skilfully practised in the western part of the Province, especially in Annapolis, King's, and Hants counties; but in the east, it is little attended to. There can be no question, that wherever soil and circumstances are favorable, it well deserves attention, on account of its market value, and its contribution to family comfort and the beauty of the farm. I shall, under this head, notice a few requisites for a good orchard, not sufficiently attended to in some parts of the Province; and the remedies for the more destructive blights and diseases to which fruit trees are liable.

It is of the first importance to have a suitable soil and exposure. The apple prefers deep loams, or sandy loams;—the red loams of various parts of the Province, and the deep shingly soils of the inland hills, are especially adapted to it. The pear does well in similar soils. The plum does not object to a stiff clay, and will not grow luxuriantly in some of the lighter soils, in which the apple flourishes. The cherry, on the contrary, prefers a light dry soil. Much can be done, however, by proper drainage and manuring, to render all ordinary soils suitable to these and other fruit trees. A good exposure should be selected; and where there is not natural shelter, belts or rows of trees should be planted on the sides exposed to the cold winds. Cherry trees suit well for this purpose; so do spruces. The butternut tree has also been recommended; and, indeed, any rapidly growing tree, suitable to the soil, will serve the purpose. The ground should be well tilled, drained, and manured. It is folly to plant valuable trees in a poor, cold, undrained soil; and it is folly to plant worthless or inferior trees at all, when good sorts can be procured.

Trees should be lifted with care, so as not to injure the roots, as these are all required to nourish the tree. They should be planted with like care,—spreading out the roots in a natural form, and trimming off some of the young shoots from the top. Holes for planting should be made both larger and deeper than is absolutely necessary; and the surface-soil, with compost or rotted manure, should be turned

into the bottom of the hole. If the soil be deep and dry, the tree may be set pretty deeply; if cold and shallow, the tree should be nearer the surface. The earth should be carefully pressed around the tree; and a little straw, or a few sods or some eel-grass, laid on the surface, to preserve the moisture of the soil. Bones, parings of hides and horns, hair, and similar animal matters, are excellent and permanent manures for young trees. After planting, the ground should be kept clean, and regularly manured with old compost, ashes, ditch cleanings, or animal matters; and on no account must it be allowed to become covered with a tough grass sward, especially in the case of apple trees. Trees are often seen growing in old grass sward, regularly mowed, and seldom or never manured. Such trees must eventually become unproductive and diseased. Trees extract large quantities of matter from the soil, and require plentiful manuring, especially when another crop is being taken from the same soil. Hence it is a good plan to plant orchards very open, and to cultivate and manure the ground in regular rotation; taking care not to damage the roots unnecessarily, and not to leave the land long in grass. The apple is much benefitted by frequent stirring of the soil;—stone fruits require less of this, and are more apt to be injured by wounds inflicted on their roots.

When it is desirable to plant out trees before the ground is properly prepared, or when it cannot be tended as it requires, seedlings or slips may be planted out, instead of grafted trees; and such of them as become strong and vigorous, may afterwards be grafted with good sorts. In like manner, farmers who have young trees of wild or inferior kinds, may have them headed down and grafted upon;—if skilfully done, the grafts soon come into bearing. In planting, abundance of space should be left for air and light. When early produce is desired, the trees may be planted at half the proper distance apart, and each alternate tree may be forced into early bearing, by free pruning. These trees may afterwards be cut out, when they interfere with the others.

Pruning is a most important part of orchard management. Trees should be kept open, and trained symmetrically, so as not to permit the branches to interfere with each other, and to present the greatest possible surface to air and light. There are various modes of pruning, but all depend on this principle; and wall, espalier, round, oval, or conical training may be preferred, just as one or other may appear, in the circumstances or situation, to be more or less adapted to promote access of air and light. The perfection of pruning, is to study the growth of the tree, and cut out as early as possible every twig that interferes with the intended plan, or with the symmetry of the whole. When it becomes necessary to cut out large branches, more or less permanent injury to the tree is almost unavoidable. The cutting off of a large branch is somewhat analogous to the amputation of

a limb in an animal, and more or less deranges the circulation of the whole system. Large limbs should be pruned in summer; small twigs may be freely cut in spring. Experience has shewn, that the dangers of spring pruning, in the case of considerable limbs, are much greater in stone fruits than in apples and pears.

On the subjects of grafting, and selecting of sorts of trees, I may refer every beginner in orchard culture to Cole's American Fruit Book, a cheap and excellent little work.

The *diseases* and *enemies* of fruit trees should be carefully studied, both in books and in nature, by every fruit cultivator. They are very numerous and troublesome, though often sufficiently interesting and curious. In the following remarks, I shall give principally the results of my own observations in this Province; and it is, of course, possible that I may have overlooked some pests of the orchard known to other persons.

1. The *Scale Insect* (*coccus*) attacks the apple tree, and, though not rapidly destructive, much impairs the vigor and productiveness of the tree. It is a small whitish creature, residing under a greyish scale attached to the bark, and is, in its adult state, quite incapable of locomotion. It appears to subsist by sucking the juices of the inner bark, to which, when very numerous, they give an unhealthy brown colour. In autumn, the adult deposits under the scale a number of whitish eggs, and dies. In spring, the young are hatched on the approach of warm weather, usually in May, and make their way to the younger twigs and branches, where they fix themselves, and acquire a scaly coat, like their parents. To destroy these insects, the branches should be washed with lime in early spring. This prevents the young from extricating themselves from the old scale, or from attaching themselves; and they consequently perish. At the same time, the tree should be well manured, to give a vigorous growth, and the loose outer bark should be scraped from the trunk before the lime is applied. In this way a cure can be easily effected, in the case of small trees.

2. The *Tent Caterpillar*, or web-weaving caterpillar, attacks all kinds of fruit trees. It is the larva of a moth, which in autumn deposits its eggs in a ring surrounding a branch. When observed in autumn or winter, these deposits of eggs should be removed. The trees should also be carefully examined in early spring, and every little cobweb curtain that is observed, should be cut off, and its inhabitants crushed; or if it be too large to permit this to be done, without injury to the tree, the web and insects may be brushed off with a mop, or broom, dipped in a strong solution of soft soap.

3. The *Canker-worm* is a caterpillar of gay colours, and ornamented with long tufts of black hair. It is the most beautiful of our caterpillars; and, singularly enough, in its perfect state, it is one of

the plainest of grey moths. The female is an unsightly wingless creature, remaining motionless on the spot where she emerges from the hairy cocoon in which the full grown caterpillar envelopes itself, when about to enter on its torpid or pupa state Attached to this cocoon, she deposits a mass of eggs, enveloped in a hard spongy whitish varnish, intended to protect them from the rains and storms of winter. Owing to this circumstance, the eggs are easily observed; and when seen in autumn or winter. attached to limbs of trees, fences, or buildings, they should be brushed down and destroyed. When the caterpillars are hatched, if abundant, they soon strip a tree of its leaves; and means should at once be resorted to for their destruction. The best method is to drench the tree with a solution of whale oil soap, or soft soap, common soap-suds, or weak potash ley. This may be sprinkled with a mop of rags, or, better, with a garden syringe Small trees may be sufficiently sprinkled with a garden watering pan. Soap applied in this way, is a useful remedy for the attacks of all kinds of caterpillars. Much injury may also be prevented by smearing the lower part of the trunks of trees with tar in spring; as some kinds of caterpillars, and the canker-worm among the rest, are occasionally hatched on fences, outhouses, &c., and make their way into the trees by climbing the trunks. A good plan is to tie a sheaf of straw around the trunk of the tree. This appears to be an effectual barrier to the ascent of caterpillars, and does not injure the tree, which tar is by many supposed to do. American books say, that the canker-worms may be shaken down from the tree, and destroyed on the ground. I have not found this to be the case with the species common here, as it clings very tenaciously to the limbs. Some other kinds of caterpillars, may, however, be shaken down.

4. The *Apple worm*, the larva of a species of moth, burrows in the apple, devouring a part of it, and causing it to fall prematurely. On arriving at maturity, the grub creeps into a crevice, or sheltered place, and spins a neat whitish cocoon, within which it remains till it comes forth in the perfect state. The best remedy is to pick up and destroy all the fallen apples; hogs are sometimes allowed to devour them. If this be attended to, the numbers of the apple-worm will speedily be diminished.

5. The *Black Wart* attacks plum trees, and sometimes cherry trees; and if allowed to proceed unchecked, is a fatal disease. It seems to be a fungus, analogous to the "spunk" and other dry fungi often found on forest trees; and it probably diffuses itself by spores, or dust like seeds, carried by the wind. Every affected branch should be cut off so soon as the disease is observed, and should be burned, or carried to a distance from the orchard. In the case of plum trees, salt, or pickle—which, in moderate quantity, is by no means injurious to these trees—should be scattered around them; and though it may

not wholly prevent the black wart, it will much mitigate its destructive effects.

6. The *Plum Weevil* (*curculio*) is a small beetle, which deposits its eggs in the young plum. The grubs prey on the fruit, and cause it to fall prematurely; after which they burrow in the ground, and come forth in the next season as perfect insects, which creep or fly into the tree. The remedies which have been found useful, are: 1. Manuring with salt, which is said to render the fruit distasteful to the grub. 2. Picking up and destroying the fallen fruit. 3. Putting a girdle of cotton wool or tar around the trunk, which arrests the beetles in their ascent. 4. Treading the ground hard around the tree, which tends to prevent the grubs from burrowing. Plum trees, in light soils, are more liable to be attacked by these insects than those in stiff soils.

7. *Plant Lice*, and *Mites*.—These creatures are often injurious to fruit trees, especially to the plum, and sometimes kill them. A little red mite, and two or three species of green and black plant lice (*aphis*) have been especially troublesome in this Province. The best mode of destroying these creatures, is, to drench the tree with soap-suds, or ley, or to smoke it with tobacco. The larvæ of the common little red *lady bugs*, are great devourers of aphides. They are hedious-looking large-headed grey caterpillars, which, when disturbed, erect themselves on their tails with a jerk. Their good offices in destroying plant lice, entitle them to rank as true "farmers' friends."

8. The *Cherry Slug* is a small limy dark-coloured caterpillar, the larva of a little blackish fly. They often appear in cherry trees, in considerable numbers, without doing much injury; but when very numerous, they should be destroyed, by dusting the leaves with wood ashes or lime.

9. It may be remarked, in general, with respect to all the enemies of fruit trees, that the orchardist should encourage all the insectivorous birds,—robins, swallows, fly-catchers, titmice, wrens, warblers, &c.,—to frequent his orchard. Some of these birds commit occasional depredations; but, in the main, they are admirable assistants in the destruction of noxious insects. They should be protected from injury; and the cultivator would do well to imitate them, in their activity, vigilance, and prying search for every living thing that shelters itself in bark, leaf, or limb.

I close this subject, by a few remarks on the smaller Garden Fruits:

Red and white Currants, of good and large varieties, are pretty and useful fruits. They often fail in this country, in consequence of the attacks of plant lice, which cause the leaves to fall off prematurely. When the leaves are observed to be a little puckered and

discoloured by these insects, the bushes should be watered with tobacco juice, or soap suds, or should be smoked with tobacco. Currants should be well manured annually; and the red and white varieties should have all the tops of the young twigs pruned off every spring.

The *Black Currant* does not require pruning of the young wood, but is rather injured by it. The difference, in this respect, between the black and the red, is caused by the circumstance, that in the latter, the fruit is produced by the new annual shoots, as in the raspberry; while in the former, it is produced by the wood of last year. The black currant should, however, have old and decaying branches cut out, and it should be well manured.

The *Gooseberry* requires a good soil, and not a very sunny situation. They should be trained on one stem, in the manner of fruit trees, kept open by pruning, and well manured every spring. The advice given in some American books, to train them in bushes, like currants, is very bad, as they are usually very unproductive in that form, at least in this climate. I have bushes trained on one stem, now over twenty years old, and still bearing well. In planting out slips, the tops should be cut off, and all the buds, except one or two at the top, should be nipped out. This tends to produce a clean stem and round top; and care should be taken to cut out all young shoots from the root. When gooseberries are infested with maggots, the bushes should be shaken, and the fallen fruit collected and destroyed. The hairy varieties are less liable to the attacks of worms, than the smooth. If planted in a cool soil, properly trained and pruned and well manured, milldew, which is often very destructive to the fruit, need not be dreaded.

The large varieties of garden *Strawberries* may be very profitably cultivated in the neighbourhood of towns. They may be planted in rows, and kept clean with the plough and hoe. The strawberry soon exhausts the soil around its roots;—for this reason, the plants should be frequently manured with old compost ashes or guano; and every two or three years they should be transplanted. The following easy method is pursued near Boston: "The vines are usually transplanted in August. The rows are formed eighteen inches or two feet apart. The runners during the first year are destroyed In the second year, they are suffered to grow and fill the intervals; and in the autumn of that year the whole old rows are turned under with the spade,—and the rows are thus shifted to the middle of the space. The same process is repeated every second year."

The *Cranberry* might also be made a profitable object of culture, where there are peatty soils which can be drained, or are naturally dry. The method followed successfully in the United States, is as follows: Drain the bog; take out any brush that may be growing on it; cart on some beach sand, and plant cranberry sods at the distance

of four feet apart;—the planting is usually performed in autumn. In three years, the ground will be covered. The berries are gathered with a cranberry rake, and a man can thus gather 20 to 50 bushels per day. One farmer in Massachusetts is stated to have raised 400 bushels in one year, the value of which was $400.*

* American Orchardist.

CHAPTER XIII.

ROTATION OF CROPS.

The following is extracted from Peters' Hints to the Farmers of Prince Edward Island :—

"Rotation of crops is to grow different kinds of crops in succession, on the same field—such as roots, grain, and grass. To lay down any particular course, to be followed by all, would be absurd, for, as observed by Allen, the proper system of rotation any farmer should adopt must depend on all the circumstances by which he is surrounded, and must vary according to those varying circumstances. Though the chief object in introducing the subject here is to point out one great and common error in our present system, yet, as the reasons which render it necessary, and the principles which should guide the farmer in selecting his rotation, should be understood by all, they may be here briefly adverted to. It has been discovered that every crop takes away from the soil certain quantities of nutritious matter, without which there would certainly be no crop ; and that no two different crops abstract these nutritious matters in the same proportions. For instance, the turnip takes away from the soil a large quantity of one kind of nutritious matter—wheat a large quantity of a different nutritious matter, and hay a large quantity of nutritious matter different from both turnips and wheat; therefore, though a field may give a sufficiency of that kind of nutriment which is principally required by one crop, yet if another of the same kind immediately follows, there will be a deficiency for it; but if a different crop succeeds, there will be found enough of all the materials it needs fully to manure it; and when a third crop of another description follows, which requires nourishment different from either which have preceded it, the soil may be in a condition to yield a good crop of the last also. But as every crop takes away more or less of all the nutritious matters which the soil contains, 'if a succession of crops, (no matter how different the kinds which succeed each other may be) are gathered and carried off the land, without the occasional addition

of manures, they will be found gradually to diminish in quantity till they reach a point (which, under the same system, many farms in this Island have long since reached) when they will scarcely pay the expense of cultivation.' But the great error here, and to which I desire particularly to direct attention, is the cutting hay for years in succession on the same land; it is this practice which has ruined half the lands of the Island, and will impoverish the farm of every man who perseveres in it. It seems generally laid down in these countries where great science and great experience have combined to ascertain what is best, that on light soils, such as this Island, two successive crops of hay should not be cut on the same field; or if a second crop is taken, the field should receive a top dressing the previous autumn or spring. I know the danger of saying this. Many will exclaim: It is impossible for us to do it—where can we get manure? and if we had it, how can we dress so much land? what would we do for hay to feed our cattle? what folly to recommend a system which the circumstances of the country will not permit the people to follow! and under this impression will, perhaps, throw away the book, determined to persevere in the present ruinous system. But withhold your condemnation for a moment. I am aware that even a bad system cannot, without inconvenience—perhaps loss—be entirely changed at once; it would not be prudent to attempt it, and I do not advise you to do so. There is no harm, you must admit, in showing what other countries, with soils similar to our own, have found best, nor is the difficulty of at once adopting it any reason why we should not make gradual approaches towards it. And let us see whether the difficulties are really so insurmountable as they may at first appear.

First, as to where you are to get manure, I would refer you to the first chapter, and ask you if you are guilty of the neglect, or permit any of the waste there pointed out; if so, correct it before complaining on that head. Secondly, I would urge you to recollect that one acre in good heart will yield as much hay as three in bad; the labor, therefore, of giving a light dressing (say twenty to twenty-five loads) of mud and ashes, or mud and lime, or mud and urine, or dung compost, would not be so great, when you have to go over only one acre instead of three. Thirdly, consider whether you really require so large a quantity of hay. If you cultivate a large breadth of turnips, you will have a large quantity of straw from the succeeding grain crops; straw and turnips will keep cattle as well as hay, and much better than the red top and natural grass which forms a large part of the hay cut on worn out lands. It will also suggest itself to you, that by turning the field to pasture before it is exhausted, the herbage will be greater in quantity and richer in quality, the cows give more milk, the dairy yield more and better butter and cheese, the young cattle grow more vigorously, attain their full size earlier, and make more beef, the mutton be fatter, and both draw more money

from the butcher; and, though last, not least, your land will be improving, instead of getting worse. These advantages should be fairly placed to the credit of the new system, before you resolve to continue the old.

The remarks of Professor Johnston in his report on the Agriculture of New Brunswick, are so applicable to this subject, that I cannot do better than transcribe them here. He says:—

'As regards his crops, the New Brunswick Farmer follows a system, which, even where regular manuring is practised, would injure the land, and which is therefore condemned and avoided by all good farmers; but which, combined with the waste of manures and neglect of manuring, is certain to entail an early exhaustion. I mention particularly the *repeated successive crops of hay* which are taken year after year from the fields.'

'This custom, which is characteristic of these North American Provinces, and has been naturally fallen into in consequence of the necessity of providing a large supply of winter food for the stock, is very injurious to the land. This, I believe, is generally acknowledged; but the plea of necessity is urged as an excuse. It is not necessary to cut hay off the same land year after year, without returning to it any manure; neither is it necessary to feed stock altogether upon hay. I infer that the land of this Province, when fairly treated, must be prone to produce abundantly, from the large returns which the farmers expect, and actually rob the soil of, after once manuring. I visited the farm of a most intelligent gentleman, one of the best farmers in his neighborhood, and I believe most desirous to improve, who informed me that, after one dressing with mussel mud from the sea bank, not far from his farm, he had taken one crop of potatoes or turnips, one of wheat, and *eight successive crops of hay*—and he seemed to think that the land had used him ill in not having given him more. For the first four crops from such an application, a British farmer would have been thankful and content; and in taking them, he would have been thought rather hard upon his land too.'

'*The repeated succession of crops of grain* is open to similar reprobation. In remote districts of Scotland and England, the practice may be found still lingering; but it brings on ultimately a species of exhaustion, which is exceedingly difficult and expensive to repair.'

'*The want of a rotation of crops* is evident wherever the abovementioned practices, of taking successive hay or grain crops, prevail. But generally, throughout the Province, the neglect of a proper and profitable rotation must be reckoned among the defects of the prevailing husbandry; wherever the system of regular and copious manuring takes root, as an indispensable means of melioration, a well considered rotation of crops must accompany it, if the full benefits of good manuring are to reward the farmer's labors.'

The rotation in general best adapted to this Island—varied, of course, according to circumstances—would seem to be after lea ground is broken up: first year, oats; second year, turnips, carrots, parsnips, potatoes, or Indian corn, with manure; third year, wheat or barley, with grass seeds; fourth year, hay;—if the land is top-dressed the previous spring or autumn, but not otherwise, fifth year, hay also; sixth, seventh, and eighth years, if required pasture; and then break up and commence again—with oats; when the ley is old and stiff, oats are often taken the second year also, and the second crop is often better than the first, owing probably to the cold in winter not allowing the sod to decay in time to give full nourishment to the first crop. This practice, though contrary to the general rules of good husbandry, may, under the peculiar circumstances, properly form an exception to the general rule: it should, however, be cautiously followed, and never adopted unless the sod be old and stiff, and then it would be better to follow the oats with rye—a crop which should be more generally cultivated, as it does not require strong land, and, if wheat fails, will furnish the farmer with excellent bread.

Grass seeds, particularly red and white clover, should be liberally sown with grain, else both the subsequent hay crop and pasture will be deficient. No one should sow less than 6 lbs. of red clover, and two of white, in addition to timothy, per acre—and double the quantity will do no harm. Red clover takes a great deal of its nourishment from the atmosphere, and its large roots, when they decay, tend greatly to improve the soil; and without white clover, pasture will not be what it ought."

The following admirable plan for a rotation of crops by a farmer in the district of Montreal, is worthy of the careful study of every farmer. It is reprinted here, from the translation by Dr. Robb, published in New Brunswick in 1851:—

EXTRACTS FROM "THE GENERAL MANAGEMENT OF A FARM IN LOWER CANADA."—BY A SCOTTISH FARMER.

1. *Requisites of a good system.*

1st. It ought to be economical, and not require more capital than the actual system, or rather than the present absence of system, requires. It is undoubtedly of great advantage to apply capital to the land, but this advantage is in general beyond the reach of our farmers, as their means are not sufficient.

2d. It ought to restore fertility to the soil, and maintain it by the products of the land itself. Manures got from other quarters than the farm itself, are always expensive, and, at a distance from town, are often not to be had at all.

3d. It ought to be simple and of easy application.

4th. Finally, it ought to have experience clearly in its favor.

2. *Experience of the writer.*

I came to the country thirty years ago, and burdened with a debt of £40; I leased a worn-out farm in Lower Canada of eighty-four acres, in the midst of a French population, and at an annual rent of £45. Well, in the space of 21 years, I have paid my original debt, and saved enough to enable me to purchase in the same neighborhood a much better farm than the one I rented. The owner of the farm which I bought, was going on every year from bad to worse, until he was forced to sell it, whilst I, the tenant of a less productive farm, and paying rent all the while, was enabled to buy him out, as just said. What was the reason of this anomaly? The Canadian was stronger than I was, had equally good health, and had no rent to pay. The reason was that he had no system; he let his land become exhausted and full of weeds; he let his stock starve; he wasted his manure, the gold of the farmer, and let every thing go to ruin for want of method; but when I had got hold of this same farm, and had applied the system which I am about to describe, the whole was brought gradually, field by field, into good condition by the end of six years; since then, the condition of the land has steadily improved, and that by resources drawn wholly from within itself. The system to which I allude, is known to all good farmers every where as the basis of all improvement, I mean that of

3. *A rotation of Crops.*

There are two sorts of reasons in favor of this plan of rotation of crops.

1st. Because different plants draw from the soil different sorts of food, so that one plant will grow freely in a soil which is worn out as regards another.

2d. Because the crops being various, the occasional failure of one is not so much felt, seeing that the others furnish subsistence sufficiently without it.

The cultivation of a fair proportion of all the varieties of crops which Providence permits to grow rapidly, ought therefore to be considered as the best means of adverting a famine; and what intelligent farmer, with the case of Canada and Ireland before him, would wish to be limited to the culture of wheat and potatoes only?

4. *Plan of the Rotation.*

Divide the arable portion of the farm, whatever may be its size, into six parts, as equal as possible, with a direct communication from the barn yard to each field, and from one field to the other, so that

the cattle may pass from one to the other when required. This division into six fields, may require on most farms new fencing, and it will be proper, beforehand, to see how this can be done with the least possible expence. I shall now suppose the farm prepared to receive the application of this system, and that is the one which I have found the best for even the poorest settler.

1st. Root crops, such as potatoes, carrots, beets, parsnips, &c., [turnips and also flax], and in cases where the land is not sufficiently open for a crop of this kind, the field must be left in fallow.

2d. Crop of Wheat or Barley.

3d. Crop of Hay.

4th. Pasture.

5th. Pasture.

6th. Crop of Oats or Peas.

In beginning the application of this system, that field of the series which is in best condition for a Root crop, should be called Field A

The best for Wheat or Barley - - - - B

That which is actually in Hay, - - - - C

The Pasture Fields - - - - D & E

That which is best for Oats or Peas, - - - F

Each field for the first year ought to be appropriated to the crops above mentioned, and after the fashion now in use among the farmers of Lower Canada, except in the case of field A. By this plan, they will at all events still get as much from their five fields as they get at present.

The culture of field A and of crop No. 1 come up together for the first year, and ought to be the object of special attention, as this is, in fact, the key to the whole system; for the good culture of this field has for its object, and ought to have for its effect, not only a good crop the first year, but also to improve the land for the five other years of this Rotation of Crops.

In the following year, the cultivation of the different crops will be according to the following order:

Crop No.	2	in the field	A
Do. "	3	"	B
Do. "	4	"	C
Do. "	5	"	D
Do. "	6	"	E
Do. "	1	"	F

and so on, changing each year until the seventh, when crop No. 1 will come back to field A, and the whole will then be in a good state of fertility, and free from weeds. The above system has been proved to be capable of restoring old land, and extirpating all weeds.*

In order to render the thing more simple and easy of comprehension, I shall suppose myself to be again obliged to take a worn-out

* Journal New Brunswick Society, p. p. 26, 45.

farm in the autumn of 1849. The first thing that I should do, would be to divide the land into six fields, by proper fences, to prevent the cattle going from one field to the other; and I would then take for field A, that which appeared best for green crops or root crops; I would collect all the manure which I could find in or out of the barns, I would take up the flooring of the cow-house, stable and piggery, and I would take out as much of the soil underneath as I could get, for this soil is the essence of manure, one load of it being as good as four or five loads of common dung. The portion thus removed ought to be replaced by an equal quantity of ordinary soil, or, if it be possible, of bog earth, which might be removed when necessary afterwards.

The dung and other manure thus collected, should be placed on the field A, in September, or the beginning of October, spread with care (as far as it will go), and covered up in a shallow furrow. Manure aids the decomposition of straw and the weeds of the soil, and frees it from these plants, which thus help to keep the soluble portion of the manure, until its juices become necessary for the crops of the succeeding years. The greater variety there is in the crops of this field, the better it will be, provided the soil is suitable for them. Thus, this field ought, as nearly as possible, to look like a kitchen garden.

5. *Crop 1st.—Root or Green Crop.*

Under the actual circumstances of the country, I would particularly call the attention of the farmers to the cultivation of the Carrot as being one well adapted to our soil and climate.

The land which has been manured in the fall, as above described, ought to be ploughed at least twice in the spring, the one furrow across the other, and both as deep as possible. It is then to be harrowed until it is properly mellow. You then make with the plough two furrows, distant two feet, or two feet three inches from each other, taking care to raise the soil as much as possible between each. You pass the roller over this ploughed portion, and then with the corner of a hoe, make a small furrow or drill along the top of the rows; drop the seed into this furrow, and pass the roller over it again: this last operation will cover the seed sufficiently.

If you can get a seed sower, that will simplify matters considerably. A roller is essential in the culture of root crops which spring from small seeds, but it can be readily got by all farmers. A log of twenty inches diameter, and five feet long, with a pole fixed at each end, will do the business admirably.

Carrot seeds (and you may say the same of the other seeds,) ought to be soaked in rain, or soft water, until they are about to sprout, and then rolled in quick-lime until the grains are dry enough not to stick to each other. When there is no lime, wood ashes will do as well.

A pound of seed, if it be good (and you ought always to try it before sowing,) will be sufficient for one acre of land. By the above plan, the young plant will come up before the weeds, so that it will be easy to distinguish the rows of carrots before the weeds appear: this renders the cleaning comparatively easy, since it may be done (except the thinning) by means of a cultivator. This cultivator is an instrument which every settler ought to have, and which, like those already mentioned, is extremely simple in its construction. It is made of three bars of wood joined in front, and separated behind, according to the width of the furrows which you wish to clean. This instrument, called the Horse-hoe or Drill-harrow, or Cultivator, is drawn by one horse, and has handles to it like a plough, only lighter. A man or a boy may guide it, so as not to touch the rows of Carrots or other crops, but only to raise the soil to a greater or less depth, at pleasure. As soon as the weeds appear, you draw this harrow between the rows, so as to bring the soil as close as possible to the young carrots, but without touching or covering them. This process will keep the plants sufficiently clean until the time for thinning them and leaving them four or five inches apart from one another; soon afterwards you may plough between the rows thus harrowed and raised. These operations do good to the plant, by permitting air and moisture to have access, and by facilitating evaporation. My plan for gathering the carrots in autumn, is to pass the plough along the right side of the plants as close as possible, without injuring them: this frees them on one side, and the stem is strong enough to allow us to haul up the roots by it afterwards.

This method of culture requires a good deal of labour, but the return is more than enough to recompense the farmer.

When we consider the large amount of nutritive matter contained in this root, and its general application to all the living things on a farm, its culture cannot be too strongly recommended, besides it is relished by all animals, especially by working horses, to whom it may be given instead of oats.

I have dwelt particularly upon the culture of the carrot, because the same method applies to the culture of all the root crops, which can be advantageously grown in this climate, such as Parsnips, Beets, Mangels and Turnips.

Parsnips will grow in a close soil, almost in clay, and do not require cellars, since they will remain uninjured all winter in the ground. In this case you will have them in the spring, affording a new and succulent food, at a time when it is most necessary. Every animal will eat parsnips with relish, and cows fed upon them yield a very rich milk.

Beets and Mangels have the same value as a crop, and as food for milk cattle; but I do not consider them to be so good for fattening cattle.

[In spring, all the manure made during the past winter should be carted to the field, placed in a heap, and twice turned. All bones should be gathered and broken up with a hammer, all coal and wood ashes, scrapings of sewers, the dung from the fowl house, and the contents of the privy, should be collected and made into a compost, with dry loam or bog earth.

The above manure may be used for that portion of the field devoted to cabbages, potatoes, and turnips. It should be put in the bottom of the drill on which the above are to be planted or sown.

When the ground is properly ploughed and harrowed, and a sufficient quantity of sound seed sown,—say, at least, four pounds to the acre,—the Turnip crop is as certain as any other.

The sowing of turnip seed should be commenced early in June, and may be continued up to 20th July. If the fly takes the first sowing, a second will be likely to succeed.

The turnips, when well up, and getting strong, should be thinned out to a foot apart, and the hoe and cultivator passed through them at least twice before they meet in the drills.]

If the land is too heavy for root crops, beans and green peas will suit for No. 1, taking care to sow them in drills, and to prepare the land as above described for root crops.

If it be thought absolutely necessary to summer-fallow,—that is, to plough without sowing,—which only happens when the soil is so hard and heavy that it cannot be pulverized in any other way, you ought not to spread the manure on the land in the preceding fall; but plough the land, and ridge and furrow it with as much care as for a crop. You need not touch it again before the month of June: when you must plough it again, and harrow it, so as to render it even, and destroy the roots of the weeds. You may then draw the furrows in a straight line, giving them a uniform breadth, and so as to facilitate drainage. About the middle of July you must plough it again, and sow it with plenty of buckwheat. At the end of September, plough it again, having previously spread it with dung. In this case, the buckwheat is ploughed under with the manure, and serves greatly to increase the latter. The land thus prepared, ought to be sown with wheat in the ensuing spring, and you may add a little timothy and clover. A bushel of timothy will suffice for four or five acres, and three or four pounds of clover to each acre.

By following the method above described, you will have, in the year 1851, quadrupled, or more than quadrupled the fertility of the soil.

6. *Succeeding Crops of the Rotation.*

I have now done all that I can for field A. I have weeded and manured it as well as I can; and after having taken the crop of roots,

and the crop of wheat or barley next year, I leave this field to rest until the other fields have been improved in the same way, and according to the method above described. When this shall have been effected —that is to say, in the space of six years, or in the year 1856—the worst will be over, and the battle may be considered as gained. The fields will then be in a clean and fertile condition, and their value wi l consequently be greatly increased. The farm of seventy or eighty acres, which in 1849 only sustained three or four miserable cows, and perhaps no more than an equal number of sickly sheep, will be capable, in less than ten years, of furnishing an abundant subsistence for ten or twelve cattle, and other stock in the same proportion.

One of the great advantages of this system of rotation of crops is, that the pastures, which in summer furnish summer-feed for the stock, are in due proportion to the quantity of roots and hay destined to winter-feed them, and in due proportion to the straw which the grain-crops yield for their bedding. I will observe here that farmers—except those who live near towns, where they can easily procure manures—ought never to sell a single load of their hay, straw, or roots; since the whole ought to be consumed on the farm, with the view of procuring a sufficiency of manure therefrom, whereby the fertility of the soil is to be sustained. But if the farmer is not to sell hay, or straw, or roots, what is he to sell? I answer: the third of the land being, under this system, appropriated to grain crops, he will always be able to sell a large part of them. The half of the farm being in hay and pasture, will allow it to produce a large quantity of butter, cheese, butchers' meat and wool; and to sell a considerable part of these, after having supplied the wants of the family. It may be said that six years is a long time to wait for the renovation of the whole farm; but I will reply, that I know of no other means by which it may be done in less time, from its own resources; and it is worthy of observation that the land is improving every year. The produce is larger, even for the first year, under this system, than it is under the present mode of culture; and, from year to year, the land is improving, field by field, and is producing more and more, so as to pay the farmer better than it does at present, and to recompense him doubly afterwards, when the whole shall have been improved under a system of rotation.

It may be objected, that two years of pasture is a long time of rest for the land; but you will observe that the land does not remain unproductive during this period of repose. This plan not only contributes to re-establish the almost exhausted fertility of the soil (and it will be admitted that this is the only one now practised by the Canadian *Habitant*), but it is also the best means of furnishing the farmer with the first necessaries of life, and the articles which, so to speak, will most readily find an outlet in our markets—such as beef, lard, mutton, butter, cheese, wool, and other products already named.

Manures are of the first importance to the farmer, and he must do

everything in his power to increase their amount. The system here proposed, is calculated so as to increase the quantity of manure in proportion as the soil becomes improved. As already said, the farmer ought not to sell a particle of his hay or straw, because these are the principal materials for manure: and, consequently, it is infinitely worse to sell the manure itself. The manure thus economized, will suffice each year for the field which is to receive the root crop, (No. 1.)

After the crop of oats, (No. 6), the land is not yet exhausted, and might even yield another grain crop. It is better, however, to preserve this fertility, than to be obliged to bring back continually this degree of fertility.

In this short treatise it is impossible for me to mention one hundredth part of the means which we have of increasing our stock of manure. I shall content myself with alluding to the rich deposits of bog-mould which we possess, and the limestone, which can be had everywhere. The very weeds, even, which are the curse of our fields, may be converted into good manure.

6. *Stock.*

As for the sort of stock which ought to be kept, I would advise a regular proportion of all the animals which prosper with us; because one sort may be fed on the food which another will not touch. For instance, sheep eat greedily and get fat upon French beans, which no other creature but man can use.

The Canadian breed of cattle, is, perhaps, the best for the country, and the best to yield milk, butter, &c., provided care be taken to select the best bulls and cows to breed from. Too much care cannot be given to this point; and the calves must be supplied with good and abundant food. If it be desirable to cross the breed, so as to increase the quantity and quality of the milk, this can only be done with the Ayrshire breed, —seeing that the larger breeds do not do so well for the country, at least in the present condition of its pastures.

[By keeping a thorough-bred bull, and changing every three or four years, and rearing only the best heifers, the stock would gradually be brought up, nearly approaching the breed of the sire.]

A good Canadian cow will, in my opinion, give more milk for the same allowance of food, than any other breed which I know.

[The profits of the dairy depend almost entirely on the care taken of the cattle during winter. Cows warmly housed and well fed through the winter, and put on good pasture in summer, will yield much more than sufficient to pay for the difference of keep. In the Province of New Brunswick cows are generally fed on dry hay in winter, kept in cold stables, and are pastured in the woods, or on fields which have been impoverished by excessive cropping. The consequence is, that,

as reported by the Farmers themselves to Professor Johnston, the average yield per cow, for the season, is only 89 pounds Butter, or 140 pounds Cheese. In Ayrshire, as reported by Mr. Colman, Commissioner from the United States, the yield is per cow 300 pounds Butter, or 500 pounds Cheese. To ensure a similar yield, the following treatment is requsite:

Select good, well-shaped, healthy cows. In winter provide for them a warm stable on the South side of the barn. Water them in their stalls. Boil regularly for them a mixture composed of turnips, mangels, or carrots, with chaff or cut hay, and a small allowance of barley, oats or linseed: of this let them have two pail-fulls each daily—and as much oat-straw or hay as they require. In summer, turn them into fields where they can have as much grass as they can consume. The cows should calve in April: the calves to get the milk for a month, and afterwards to be weaned off with skimmed milk and boiled linseed.]

The Leicester breed of sheep is the best to give large and fat sheep; but it is not so advantageous as regards wool, which is, perhaps, the principal object for which sheep are kept. That breed which would possess a combination of the two qualities of fat meat and fine wool, and a vigorous constitution withal, would be the best for Lower Canada. To attain this object you might cross the common sheep of the country, first with a Leicester ram, so as to get a large breed, and then mix the product of the first cross with a Cheviot ram, so as to get a finer wool—or first with a Cheviot and then with a Leicester ram. In this way I have procured hardy sheep, any one of which will yield six or eight pounds of fine wool, and from twenty-two to twenty-five lbs. of mutton per quarter. In breeding, the greatest care must be taken always to choose the finest rams, and to preserve the finest lambs; and on no pretext ought the finer individuals to be disposed of.

As the keeping of sheep is of the greatest importance, and but little known, I will add a few remarks—which will be excused, since this has been the business of almost my whole life.

Sheep ought not to be allowed to run from field to field; as this gives them wandering habits, which injure them the whole summer through. When sheep are well fed and well treated, they will follow the person who has charge of them wherever he pleases; and if they are taken and enclosed in good pasture, they will give less trouble in looking after them than any other sort of stock. It is also of the greatest importance to smear sheep about the middle of November: for which purpose, I have made use of the following mixture, which succeeded wonderfully well. The quantities here indicated, will suffice for twenty sheep:

Resin,	4 lbs.
Common Oil,	6 pints.
Butter,	6 lbs.

The oil ought to be heated to the melting point of the rosin, and the butter then added, after the oil has ceased to boil, which is a point requiring attention. The whole ought to be stirred until they become thoroughly mixed; and should the composition prove to be too thick to be used, buttermilk or cream may be added, taking care to mix well. This ointment is to be smeared on the skin of the sheep in parallel lines, distant one inch from each other, and for the whole length of the creature. This application destroys vermin, invigorates the growth of the wool, and protects the animal against cold. This precaution is absolutely necessary, if we wish to secure a good flock of sheep.

Another thing of great importance is, never to shut up sheep in a close ill-ventilated place. It would be better to pen them up in some corner of the barn, rather than to treat them so. The sheep can naturally endure a considerable degree of cold, but it cannot do without fresh air; consequently the fold ought always to be well ventilated.

It is a very bad practice to let the rams walk with the sheep in autumn, because that is the reason why the ewes drop their lambs too early in the spring. The ram (and a single one will be enough for five farmers,) ought to be kept apart from the 15th of September till the 22d November; and if at this latter period he be allowed to go to the sheep, the lambs will appear about the 17th of April, and the ewe will not have had time to get worn out with suckling before going out again to the pasture.

The best breed of pigs for the country is that called the Berkshire, or Chinese; and as many as possible ought to be kept upon every farm, (that is, as many as will consume all the milk and other remains of the dairy,) and which may be fattened in the fall. That lean, hungry, long-legged, long-nosed animal, styled the Canadian pig, ought to be for ever banished. A good breed will produce double the lard, with half of the food. The Chinese, or Berkshire Boar, crossed with the breed of the country, for three or four years, will effect the necessary change.

CHAPTER XIV.

MISCELLANEOUS HINTS ON HUSBANDRY.

1. *Ploughing.*

Next to the natural fertility of a soil, and the manuring which it receives, the tillage bestowed by the farmer, is the most important element in the production of heavy crops. The thorough stirring of the ground by deep ploughing and subsoiling, deserves far more attention than it has received in this Province. The following remarks on these subjects are extracted from Stephens and Judge Peters:—

"When all the particulars which ploughmen should attend to in executing their work, in having their plough irons in a proper state of repair, in tempering them according to the kind of ploughing to be executed, in guiding their horses, and in ploughing the land in a methodical way, are considered, it ceases to surprise one that so few ploughmen become first rate workmen. Good ploughing requires greater powers of observation than most young ploughmen possess, greater judgment than most will take time to exercise, more patience than most will bestow to become familiarized with all these particulars, and greater skill than most can acquire, to use them all to the best advantage. But want of attention is the great bar to young men becoming good ploughmen; and if they do not acquire the art when comparatively young, they will never do so in an advanced period of life. It is want of attention at first, that makes some ploughmen bunglers all their days, and the great majority exhibit mediocre attainments. The latter class, no doubt, is preferable to the former, because the injurious effects of *bad* ploughing are obvious; but the effects of mediocre compared with first rate ploughing, though not so easily ascertained, must also be considerable. 'It is well known,' says Sir J. Sinclair, 'that the horses of a good ploughman suffer less from the work than those intrusted to an awkward and unskilful hand; and that a material difference will be found in the crops of those ridges tilled by a bad workman, when compared with any part of the field where this operation has been judiciously performed.' The truth is the young man desirous of being a good ploughman, ought to be taught, day by day, by an experienced workman, to temper the irons, and guide the plough according to his strength."

"A good ploughman will temper the irons so as there shall be no tendency in the plough to go too deep or too shallow into the ground, or make too wide or too narrow a furrow-slice, or cause less or more draught to the horses, or less or more trouble to himself than the work requires to be performed in the best manner; and he will also temper them so as to hold the plough with ease to himself, have plenty of leisure to guide the horses aright, and execute the work in a creditable manner. The proper *form* and *position* of the furrow-slice are essential requsites in good ploughing; the furrow-slice should always be of such dimensions and laid in such position that *the two exposed faces in a series of slices shall be of equal breadth*, and any departure from this rule is a positive fault. Laid up agreeably to this rule, furrow-slices will not only present the maximum of surface to the atmosphere, but also contain the maximum of cubical contents. The furrow-slices should be quite straight; they should also be quite parallel in length, and this property shows that they have been turned over of an uniform thickness, for thick and thin slices lying together present irregular horizontal lines. The furrow-slices should be of the same height, which shows that they have been cut of the same breadth; they should present to the eye a similar form of crest and equal surface. The furrow-slices should have their back and face parallel; and to discover this property after the land has been ploughed requires rather minute examination; but it is easily ascertained at the time of ploughing. The ground, on being ploughed, should feel equally firm under the foot at all places; for slices in a more upright position than they should be, not only feel hard and unsteady, but allow the seed-corn to fall down between them and become buried. Furrow-slices in too flat a state always yield considerably to the pressure of the foot; and they cover each other too much, affording insufficient mould for the seed. Furrow-slices should lie at the same angle (45°), thus presenting crests in the best possible position for the action of the harrows. Crowns of ridges, formed by the meeting of opposite furrow-slices, should neither be elevated nor depressed in regard to the rest of the ridge. The last furrow-slice should be uniform with those of the rest of the ridge."

"Whatever mode of ploughing the land is subjected to, you should take care, when ploughed for a winter furrow, that the furrow-slice is of the requisite depth, whether of five inches on the oldest lea, or seven inches on the most friable ground; and of the requisite breadth of nine inches in the former and ten in the latter; but as ploughmen incline to hold a shallow and broad furrow, to make the labor easier to themselves, and to go over the ground quicker, there is no likelihood of their making too narrow a furrow. A furrow-slice in *red* land should never be less than nine inches in breadth and six inches in depth in the strongest soil, and ten inches in breadth and seven inches in depth on lighter soils. On clay soil that has lain long in grass, nine inches in breadth and five inches in depth, is as large a furrow-slice as may

be obtained; but, on lighter soil, with younger grass, one of ten inches by six, and even seven, is easily turned over." Departure from the rule of deep ploughing "is admissable only in those lands where a naturally thin soil rests on a subsoil of sand or gravel, very poor and impregnated with oxides of iron. To plough deep *at once* in such soils might run the risk of injury to the scanty quantity of soil naturally existing. But it is to be observed of soils of this kind, that the subsoil has always a tendency to *pan*; and if such does exist, deep ploughing alone in the form of *subsoil ploughing*, will destroy the pan, the frequent cause of sterility in soils, by breaking it up and exposing it to the air, a way of ameliorating both soil and subsoil."

The following hints are worthy the attention of judges at ploughing matches, in which, here as in Britain, neat and uniform, rather than deep and thorough ploughing, are often preferred:—

"The primary objects of the institution of ploughing matches must have been to produce the best examples of ploughmanship, and by the best must be understood not only that which shall *seem* to be well done, but that which is thoroughly and properly done. To be particular, the award should be given to the plough that produces not only a proper surface finish, but exhibits along with that the power to cut and turn over the *greatest quantity* of soil in the *most approved manner*. Let a code of rules be instituted to guide the judges of ploughing matches, in delivering their awards. Let these rules direct the land to be thoroughly ploughed to the bottom of the furrow, as well as satisfactorily to the sight. When such rules shall be promulgated, we may hope to see ploughing-matches exceed their pristine integrity, doing good to every one concerned in them, and restoring the confidence in them which is at present on the wane."

Judge Peters strongly insists on deep ploughing, which is as much neglected in Prince Edward Island as in Nova Scotia, and from a similar cause, that desire or necessity to go over a *large surface* quickly and with little labor, which is so injurious to every branch of agriculture in new countries.

"The deeper the soil is, the nearer together can plants be made to grow, and the greater number of them will obtain perfection, and, consequently, the larger will be the crop. A deep soil also suffers less from drought and from moisture, than when it is shallow; when a great deal of rain falls, the water sinks into a soil loosened by deep ploughing; such a soil absorbs a quantity of moisture, proportionate to its depth, before it suffers any to return to the surface. This is the reason why garden ground, which is well tilled with spade labor, never suffers from excess of humidity, even when the surface of shallow soils would be drenched with moisture. So long as the water does not stand on the surface, it does little or no harm to the plants. Deep lands retain the moisture which they absorb for a considerable time, and communicate it to the surface, when that becomes parched and dried up.

Nor is this all. Crops of grain grown on deep soil suffer much less from sudden changes of temperature, or from drought or from heat; because their roots, being able to penerate further, feel changes in the weather less. During very hot weather, it is evident that the plants are much fresher in deep than in shallow soils.

Lastly, it has everywhere been remarked that grain grown on deep soils is much less liable to be laid, even when very rank in growth; this is doubtless owing to the greater degree of strength which the depth of the roots gives to the lower part of the straw —a strength which grain growing on shallow soils can never attain, because then the fresh shoots put forth by plants growing closely together, cannot find sufficient nutriment to enable them to retain their full vigor.

But if we would have a soil attain all these advantages, and permanently possess them, it is requisite that from time to time it should be ploughed to the very bottom of its vegetable layer, turned over, loosened, and every part submitted to the beneficial action of the atmosphere; unless this is done it will, if merely ploughed shallow, generally lose all those advantages of which we have been speaking. From repeated treading of the horses feet while ploughing, a hard crust, or pan, will be formed immediately beneath the sphere of the plough's action, which cuts the earth beneath it from all communication with the atmosphere, and no root can penetrate it. Thaer says:

"Experience has convinced me that it is not necessary that this deep ploughing should take place every year, but that it should be repeated once every six or seven years, especially if, during the interval, the depth of the ploughings given to it are varied, for nothing contributes so materially to form the crust spoken of as repeated ploughings of equal depth. Land ought, therefore, to be ploughed every seven years to the bottom of its layer of vegetable soil, and the intervening ploughings may be more or less superficial and varied in their depth, according to the purposes for which they are bestowed.'

There can be no doubt that the shallow ploughing generally adopted in this island is a most erroneous practice. There may be some cases where the vegetable soil is very shallow and rests on gravel or sand, where the farmer cannot plough deep without injury, but most of the soil of this island may be ploughed eight or nine inches deep with the greatest advantage. Take most of the worn out lands of the island and plough them with a furrow of six honest inches deep, and they will at once yield a better crop than they have given for the last ten or fifteen years, because the soil which would then be brought to the surface has not been exhausted. Some will try this experiment, and find what I say correct; but do not imagine because you see this worn out land all at once give a good crop, that it will continue to do so; its fertility is caused by a little fresh earth, from which certain substances necessary to the growth of plants have not been taken, and

it will soon be exhausted if you crop it without manuring, therefore sow it with buckwheat and plough it in, and treat the land as recommended in the chapter on green manuring.

Two years ago I had an opportunity of testing the advantages of deep ploughing. A field of about four acres, which had been very much exhausted, was intended for turnips and carrots; in cross-ploughing, I directed my ploughman to go nine inches deep, which, as it had only received the ordinary kind of shallow ploughing before, was very hard work for the horses, and when half the field was done I found it necessary to go three inches lighter, as the horses could not stand it. The cross-ploughing was east and west, the drills of turnips and carrots ran north and south: the part ploughed shallow and that ploughed deep were manured exactly alike, and the seed sown at the same time; but any one, in walking over the field, could see the great superiority of the crop on the deeply ploughed land; on pulling, we estimated the yield of turnips on the deep ploughed land to be about one hundred and fifty bushels, and the carrots about eighty bushels per acre over that on the shallow. The subsequent wheat crop on the deep ploughed land also maintained the superiority. I mention this as an instance of the benefit of deep ploughing, but by no means recommend any one to follow my example of deepening so suddenly; the deepening should be gradual, that is, going an inch and a half to two inches deeper at each ploughing, until you get eight or nine inches turned up. Thaer remarks:—

'In the greater number of cases in which it is desirable to plough the land to a greater depth than has before been attempted, it is best not to add above two inches in depth of virgin earth at a time to the vegetable soil, more than this quantity cannot be properly ameliorated and mixed with the upper layer.'

And this deep ploughing which brings up the new earth, ought to be done, if possible, in the summer or early in the autumn, so that the newly turned earth may be exposed to the air for the longest period of time. The air acts on certain substances in this new earth, and fits it to sustain plants, which in many cases it would not do when first turned up; an example of this may be often seen in earth dug from cellars; when first taken up, plants would not grow in it, but by being spread on the grass lands it absorbs the gases from the atmosphere, and its mineral substances are prepared by the action of the air for the plants, and thus the spots on which it is spread become more fertile. In the same manner new earth turned up by the plough enters into contact with the atmosphere, and every particle of it becomes saturated with atmospheric substances, and the new earth thus increases the fertility of the field.

Make it a rule to plough your lea land five or six inches deep, but let the deepest ploughing be given when the land is intended for turnips, carrots or other roots. I would not recommend new earth to be

brought up in ploughing land which has been in turnips or other roots, and which is intended for wheat or barley, because the manure which has been applied with the roots will then be turned too deep. I think that by thus turning up new soil when ploughing turnip land for wheat, my wheat crop has been injured, which is easily accounted for. Land from which turnips or other roots has been removed, must be ploughed late in the fall and sown with wheat very early in the spring; and the new earth, not having been long enough exposed to the air to absorb the gases and have its mineral substances fitted for the plants, checks instead of assists the growth of the wheat.

I have no doubt many will say the horses here could not carry so deep a furrow as I recommend. If they are badly fed they cannot, but let farmers keep fewer and feed them well, and any of our Island nags will be able for the gradual deepening recommended; and when once the ground is well stirred to eight or nine inches deep it is easy to plough to that depth afterwards."

2. *Recommendations selected from Professor Johnston's Report on the Agriculture of New Brunswick.*

"After what has been said in the preceding chapters on the subject of individual practice, it will be unnecessary for me now to touch upon many things which would otherwise have naturally found a place in the present chapter.

"By an improvement in practical agriculture, I understand a change in practice, which will enable the farmer to raise larger and more valuable crops from the same extent of land as before, or to produce equal crops at a cheaper rate, without permanent injury to the land. To the practical man, therefore, I wish to recommend nothing which, if rightly performed, will not, in my opinion, be the means of putting more money in his pocket.

"What I have said in my suggestions to Agricultural Societies, in regard to draining; deep and subsoil ploughing; green manuring; the use of bones; the saving of waste materials for the manufacture of manure; the covering of manure from the action of the rains and snows in the fold yard, and from the washing of the rains when laid upon the field; of the use of lime; of an earlier cutting of the grain crops; of improving the breeds of stock; of a better housing of the cattle; of the growth and use of green crops, linseed, and prepared food, during the winter months; of more diligent and more extended fall ploughing; of the value of agricultural journals and books; all this is intended as special advice also to the individual farmer. Each man can exercise a far more direct and beneficial influence; beneficial to himself and the Province—over his own practice, than societies, however zealous they may be, can be expected to do over that of the district in which they are placed. The improving farmer, indeed,

does good in two ways. He not only puts more money immediately into his own pocket; but, by the influence of his prudent and successful example, he induces others around him to follow in his steps, and to put more money in theirs also. Thus the agricultural improver, —the judicious, not the hasty and imprudent one,—is a most valuable member of society; and it is for the best interests of every country, to support, encourage, and honor him.

There are only a few additional topics on which I think it necessary to address a few observations to the practical farmers of New Brunswick.

1st. I would recommend the abandonment of the system of cropping with grain, or cutting for hay till the land is exhausted—a system hitherto so much followed in the Province. If, while the stumps are still in the ground, the land cannot be ploughed, and must be left in pasture, the manure made by means of the hay and other produce of the farm, should be collected, husbanded, and applied as a top-dressing, in spring, to the early grass. But, when the stumps are already up, and grain and root crops have been raised upon the land, the barbaous custom of cutting for hay, year after year, without manure, ought to be for ever abandoned. Such land, when in grass, may be pastured, if thought desirable, for three or four years; it may even be allowed to be in permanent pasture, with an occasional top-dressing; but not more than one year's hay ought to be cut, as a general rule, without the application of some fertilizing substance to its surface. When land has already been exhausted by such treatment, the use of bones is deserving of a careful trial.

2ndly. The custom of leaving the land to cover itself with poor, natural grass, after the grain crop has been taken off, should also be abandoned. It ought always to be laid down with grass seeds, where a naked fallow is not intended. I have, indeed, seen many cases where naked fields have shown the neglect of this most profitable practice of seeding; but it has generally been upon farms held by the poorest and most ignorant portion of the rural population of the Province.

3rdly. The adoption of a system of experimenting—prudently, cautiously, and on such a scale as, if all his experiments should fail, would not seriously affect his pocket—is the next point I would urge upon the practical man. It is a line of activity upon which he cannot too soon enter. There is a broad, intervening space between the actual condition of New Brunswick agriculture, and the condition to which it might be brought by the judicious application of existing knowledge. But that knowledge cannot be diffused among, cannot be acquired by, the farmers of the Province, all at once. What they do learn, also, they will naturally doubt, until they have seen it actually applied to, and actually causing more profitable crops to grow upon the land. It is, therefore, by a system of trials, that general confidence will be

obtained, in this or that method of improvement. The distinction between the man who desires to improve, to advance—which is a sort of condition affecting all material things in North America at the present time—and the man who is content to sit still, is, that the first endeavors to acquire information, and, having obtained an inkling of new knowledge, perfect or imperfect, shows a disposition to make use of it, to make trials of the methods of advancement in his walk, which the knowledge suggests. The maker of agricultural experiments, therefore, is the man who is acquiring knowledge, is thinking how he can apply it most usefully to himself, and is testing the opinions and recommendations he may have heard or read, by the practical means which his farm places in his hands. It is a favorable sign of the diffusion of knowledge, and of the awakening of thought and dormant intellect among the agricultural community of a country, when the habit of experimenting prudently and economically, is seen to diffuse itself among them.

The use of lime is recommended by many in the Province of New Brunswick, and, as I think, with reason. The advancing man will, therefore, try lime in a small piece of his land, if he doubts its efficacy and his means are small; he will try it in various ways, applied at different times to different crops and in different soils; and the results will determine him as to whether it would be more profitable to use it on a larger scale."

* * * * * * * * * *

"With bones, likewise, in various forms, small beginnings may be made by way of experiment. And so with all the improved practices I have directly recommended or indirectly alluded to; the really good and zealous farmer—the man who loves his art and wishes to advance it—if only for his own benefit and on his own farm—will, from time to time, try them honestly, fairly and prudently, yet fully: and will thus keep constantly advancing in experience, and in the profitable culture of his land. There is, indeed, now scarcely any field so wide as that of the experimental farmer; none so full of endless novelties which the active mind may investigate experimentally, and always with a view to profit. Unlike the old stagnant art of farming, of which the principles were not understood, the art of this present time is guided by clear principles; it is full of ever-new interest; is in a constant state of progression; and affords full employment for highly intellectual and active minds.

4thly. "In the preceding chapters I have recommended the growth of flax, to a certain extent, for the purpose of procuring linseed as a food for the stock, and fibre for the winter's employment of the farmer's household.

* * * * * * * * * *

5thly. "To one other topic I advert, because of its great practical importance, though already frequently noticed in this Report. The

improvement of the breed of stock is, in one point of view, the basis of the entire agricultural improvement of a district. Good stock necessitates good feeding. Much stock and good feeding, produces much and rich manure. Ample manuring enriches the soil, and causes it to produce good crops; and these large crops again, whether of corn, hay, or roots, afford the materials for abundant feeding, and for fold-yards full of manure.

"But, in some parts of the Province there is a prejudice against improved breeds of stock. Thus, Mr. Hubbard, of Burton, writes to me:—'The stock of the country will do better on what we farmers call stock hay, and no shelter, than the English breed will on merchantable hay, with shelter; and horses the same.' I infer from these words of Mr. Hubbard, however, that he looks for the profit of his farming, not to the stock he can *keep*, but to the hay he can *sell* off his farm. If so, he may continue to rear the hardy animals, which, after all, are Old Country stock, degenerated under the treatment they have received in the Provinces, and to make a profit by his good hay; but his land, like his stock, will degenerate in time, and it will cost his successors skill and capital to bring it back again to its original productive condition. I am informed that even the periodically flooded lands on the St. John River, no longer yield the crops of hay they are known formerly to have produced. The profit of good stock consists not only in the early maturity which they attain, and the larger produce of beef they yield from the same amount of vegetable food, but, in their furnishing also the means by which the land can be maintained in good condition, and be compelled to produce abundant crops for an indefinite period of time."

As to the benefits of shelter, there is now no question among the most experienced breeders and fatteners of stock, as well as among theoretical writers, that an animal which is kept warm thrives better on the same quantity of food, in fact can be kept in condition upon less food, than one which is exposed to the inclemency of the weather. In regard to this point there is not one law for New Brunswick and another for the rest of the world. On this point, Mr. Goodfellow, of Miramichi, writes me as follows:—

Fredericton, 29th November, 1849.

'Sir—Having been requested to give you my opinion on the treatment of Live Stock in this country, during the winter months, I beg to submit the following remarks:—

'When I first engaged in farming operations, I kept my cattle in a building similar to those used throughout this Province at the present time; but about five years ago I built a new barn on a side hill; I excavated an under story for my cattle; one side, and part of the ends, are under the ordinary level of the ground; the side facing the hollow is where the cattle enter the building, which is of frame-work, boarded and shingled. The building above is also boarded and shing-

led on the roof and sides. There is a yard in front of the under story, of forty-five feet square. A shed is built on the north and west of the yard, to break off the wind, the south side being left open.

'Since I kept my cattle in this building, they appear much more comfortable (being entirely free from cold) than they were in the former building, while a saving of twenty per cent. is effected in the food. My cattle are always in better condition in the spring than those of my neighbors who keep their stock in the ordinary buildings of the country, and much less subject to the various distempers to which cattle are liable. No inconvenience is experienced from the building becoming too warm in mild weather, as there is sufficient means for ventilation."

I cannot but recommend practical men to put faith in Mr. Goodfellow, and follow his example.

The Professor concludes with the following summary of 'Points to which individual farmers are recommended to direct their attention :'—

1st. Thorough drainage of clay soils, wet slopes and bottoms, and marsh or dyked lands, where the fall is sufficient to admit of a ready outlet, and a sufficient depth of drain.

2nd. Better clearing and deeper ploughing the soil.

3rd. More care in saving, collecting and applying manures of all kinds, liquid and solid.

4th. An abandonment of the system of cutting repeated crops of hay off the same land till it is exhausted.

5th. An abandonment also of the custom of taking repeated successive crops of corn off the same land, without alternation with other crops, and without manure.

6th. Cutting down grain of all kinds before it is fully ripe, and grass before it runs to seed.

7th. Cutting down Indian corn with a knife, as is done in New York, and use of the stalks in feeding milch cows and other stock.

8th. Sowing buckwheat or rye to plough in green, and use of bone-dust to renovate exhausted or worn out lands.

9th. Ploughing deeper, in all cases, than has hitherto been usual, but especially such land as has ceased to be productive as formerly.

10th. Taking advantage of every open day in the fall, to plough and prepare the land for the spring sowing.

11th. Selecting good stock of cattle, pigs, and sheep, for keeping through the winter.

12th. Providing warm but well ventilated housing for them.

13th. Feeding them plentifully, that they may be in good condition when the spring arrives.

14th. Growing turnips and linseed, with the view of adding to the quantity and enriching the quality of the food he has at his disposal.

15th. Collecting carefully, and preserving under cover, all the manure made by his stock during the winter, that he may have it abun-

dantly and in good condition for his potato and green crops when the time of planting or sowing comes.

16th. Manuring annually, by top-dressing his worn out hay lands, when the land is not stumped, and therefore cannot be ploughed up.

17th. Collecting carefully all waste bones, breaking them, and applying them to the land; especially the use of bones is to be recommended upon land which has been worn out by over-cropping with corn.

18th. Sowing down always with artificial grasses, when land, after a corn crop, is to be left with a view of its producing hay.

19th. To provide shelter, by fences or plantations, for his fields and stock."

3. *Agricultural Reports for Nova Scotia.*

It may be asked, why has not a collection of the methods of the best Agriculturists in Nova Scotia been incorporated with the matter contained in this pamphlet? To form such a collection would, at present, be very difficult; but the writer is fully convinced of its utility, and would respectfully suggest the following simple method, by which the best agricultural experience of our country might be treasured up for the general benefit:—

At all Cattle Shows and Agricultural Exhibitions, let it be announced that every Exhibitor must hand in to the Judges a written statement of the processes employed in the production of the article or animal exhibited by him; and let the practicability of the method, as a profitable means of production, be taken into consideration in awarding the premium. Let the statements of the successful competitors be forwared to the Central Board of Agriculture, and published and circulated in their Annual Report. This practice is extensively adopted in the United States; and I find in the preface to the last volume of the Agricultural Transactions of Massachusetts, that its still more general adoption is strongly recommended. "It is clear," says the Secretary of that State, "that from these reports and statements, the agricultural community derive no inconsiderable benefit; and that from them are to be drawn such general principles and deductions as will aid the progress of agriculture. It is only by thus recording and publishing facts and experiments that they become available to all. The advantages of such a practice would seem to be so obvious, and the obligation to observe it so imperative on the societies receiving the State bounty, that it is a matter of regret that any society should fail to adopt it. * * * But we could go even further than this; such returns should be made compulsory, under penalty of a forfeiture of the annual gratuity given by the commonwealth."

I observe with much pleasure that a number of statements of this

kind were obtained by the Secretaries of the late Provincial Exhibition, and published in their report. The following are a few selected specimens :—

"*Newport, 20th November*, 1854.

WHEAT.—"Your favor of the 20th instant has been duly received, and in reply to your inquiries I beg to state, in the first place, I sowed one and a half bushels to the acre, imported from Canada, and termed the "Golden Straw." In the second place, the soil was a dark loam—old meadow land, and top-dressed (after ploughing) with twenty-five cart loads to the acre of compost manure. This has been my general mode of management to insure a good return for my labor. Time of sowing—last week in May.

(Signed) "JAMES STERLING."

"*New Annan, December 25th*, 1854.

WHEAT.—"I sow two bushels of wheat to an acre—sometimes a little above, but never below; and two and a half of barley to an acre. I commonly sow wheat in potato and turnip land—but there is, also, another method I have adopted of late years. In the first place, I plough the sward land in the fall, and raise a crop of oats on it the first year; the second year I plough it in the spring, and raise a crop of wheat that year. The following is my method of manuring :—In the summer I haul a quantity of black mud from the swamp, put it into the sheepfold till the sheep lie on it, and I have another heap of same kind of mud before the kitchen door—saturate it with soapsuds in the spring of the year, and compound them altogether with hard wood ashes, and let it lie for twenty-four hours, till it ferments. Take it out on a horse cart, and spread it over the soil to the extent of twelve or fifteen loads to the acre, scatter it on the new ploughed land, and harrow it in. The land consists of a sharp or light upland soil. The grain which took the prize was sown the 25th day of May, both wheat and barley. I forgot to state that the land should be pastured two or three years previous to breaking up. Lastly, I sow it over with grass seed, and it yielded as good a crop of hay as any other kind of land."

(Signed.) "WILLIAM MURDOCH, Senr."

"*Newport, November 25th*, 1854.

WHEAT.—"Quantity of wheat sown was eight bushels, at the rate of about two bushels per acre. The seed was obtained in the neighborhood, but was imported from Boston about six or eight years since. Soil—clay loam. As to manure employed and cultivation of the soil, it will be necessary to revert to the year previous. In the spring of that year there was ploughed under, forty loads of green manure to the acre, and then an additional dressing of ashes, harrowed in. Thus prepared, it was cropped with mangold wurtzel. The ground was

ploughed on the 29th of last May, and the wheat sown the following day. The grain was harvested the first week in September.

The oats were sown the 15th of May, on an inverted sward, at the rate of three bushels per acre. No manure applied. Soil—inclining to loam. The land was in good heart, producing the year previous a ton and a half of hay per acre. The crop was harvested the first week in August.

Care is taken, in classing grain, to preserve the heaviest for seed. The wheat, previous to sowing, is soaked in strong pickle, and dried with either ashes or lime."

(Signed.) "ROBERT W. ALLISON."

CORN.—"The kind of soil was light, sandy soil. That is the best for corn. I find the kind of manure that I use is manure made from the pig sty—having it well rotted and fine, and the ground well ploughed and harrowed. I make the drills three feet apart; put the dung in hills three feet apart also—the hills being three feet apart each way. That, I find, is close enough for a good crop for seed. Put four or five kernels in a hill: four is enough, if they grow. Cover it with a hoe, from two to three inches deep: when it is up about three inches high, go through it and loosen the ground. In about a week go through it again, and farm the hills. About two weeks more, hoe the ground up round the stalk, leaving it till it is ripe. Some pull off the suckers at the last hoeing. This, I found, hurt the crop. Cutting off the top to let the sun get at it about a week before it is ripe, is a bad plan also. It will lessen the weight of the grain."

(Signed.) "SAMUEL FRAME."

The following additional suggestions may be of service in arranging *Agricultural Exhibitions* and Cattle Shows:—

(1.) A distinction should be made between amateur farmers, and farmers who live by the business. The former should have only medals and honorary tickets as prizes. Money prizes should be reserved for the latter. Without this distinction, practical farmers often think it useless to compete, and the prizes are all carried off by a few wealthy men, and no good is done.

(2.) Every taker of a prize should be bound to state, in writing, the method which he followed in producing the article, that others may be able to profit by his experience; and, if the methods followed be unprofitable in all respects except to gain prizes, this should be considered as a serious deduction from the merit of the exhibiter.

(3.) Some amount of care should be exercised in planning the methods of arranging and exhibiting the various articles, so as to show them to advantage, and not create confusion. A very simple arrangement for small articles, is an open shed with pitched roof, and a broad table in the centre, with a rack for hanging articles, or a tier of shelves for receiving them, along the middle of the table.

(4.) Shows should never be appointed for places in the vicinity of drinking houses; and Committees should arrange with some competent persons to provide temperance refreshments at a cheap rate, and should prevent drinking booths, &c., from being set up. It is disgraceful to allow exhibitions for the promotion of peaceful industry, to terminate in scenes of riot and drunkenness.

In connection with this subject, I may add that few things are more needed in our Province for the promotion of the healthy growth of agriculture, than a well-managed Model Farm and Agricultural School. Such an institution might fairly try and periodically report on all new methods, implements, varieties of cultivated plants, manures, &c. It would afford facilities for conducting experiments, in reference to such evils as the potato blight. It would form a nursery for good varieties of fruit trees, seeds, &c., whence the whole Province might be cheaply supplied. It would afford a thorough training to young men disposed to enter as apprentices. It might have a laboratory and Chemist, for the purpose of executing trustworthy analysis of soils, manures and minerals. If properly managed, it would be nearly self-supporting. Agricultural societies and the Representatives of the People, would do well to think of this subject. An institution of this kind might be easily and conveniently connected with the Provincial Normal School, and would communicate to the pupil and teacher that acquaintance with the practice as well as theory of agriculture, which is necessary to ensure success in the attempt to introduce the subject of agricultural chemistry into the schools.

4. *Hedges.*

A Thorn Hedge is a cheap, durable, and beautiful fence, and affords much shelter. In old settlements, where wood for fencing is becoming scarce, hedges should at once be introduced. Young thorns can be purchased in this Province at 15s. per thousand, and may be imported from Great Britain at a still lower rate. The essential requisites to success in their culture are: to have the ground deeply ploughed and well manured before planting—to keep the young hedge clean of weeds, and free from intrusions of cattle—to prevent stagnation of water by a drain running near the hedge—and to trim the hedge down close to the ground in the first year or two after planting, to promote the growth of several shoots from near the bottom of each plant. Six inches apart is a proper distance. A raised bank is not required in this climate, except in very wet land. In six to eight years a well trained hedge ought to be cattle-proof. The best form of training is broad and thick below, and narrower toward the top. Thorns may be planted either in autumn, after the leaf falls, or in spring, before it opens.

APPENDIX A.

1. METEOROLOGICAL TABLES.

I am indebted to H. Poole, Esq., for the following Tables. The first gives many valuable facts for comparison of our climate with that of other countries, and also gives a useful Agricultural Calendar, adapted to the Eastern part of the Province. The second is a very precise statement of the number of rainy days, and gives a highly favorable impression of the amount of dry working weather in this climate.

Synopsis of Dates of Sowing and Gathering, Mount Rundell, Albion Mines.

GARDEN.	1844.	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.
Asparagus cut					8 May	10 May	11 May	13 May	12 May
Beans sowed	2 May	28 April		3 May	24 April	8 April	3 May	13 May	12 May
pulled	2 August	23 July		23 July	24 July	22 July	26 July	6 August	1 August
Bush Beans sowed	20 April	30 April		8 May	5 May	8 April	1 May	13 May	7 May
pulled	2 August	29 July	11 July	2 August	21 July	28 July	26 July	10 August	17 July
Beets sowed	30 April	24 April		6 May	5 May	27 April	6 May	23 May	14 May
pulled		October		25 August	14 October	12 October	21 October	30 October	
Cabbage sowed	10 April	18 April		8 April	27 March	27 April	4 April	1 April	7 May
cut			1 w'd. 20 lbs.	26 August	16 August	1 August			6 Aug.
Carrots sowed	30 April	24 April		5 May	5 May	4 May	6 May	13 May	17 June
pulled	2 Nov.	October		25 October	14 October	24 October	21 October	30 October	
Cauliflower sowed	10 April	2 April		8 April	27 March	20 March	6 April	1 April	7 May
cut	21 August	1 August		2 October	30 July	25 July	12 August	21 Sept.	21 Sept.
Celery sowed	8 March	2 April		30 April	27 March	30 March	4 April	1 April	24 April
dug	20 August	6 August	12 September	5 October	22 September	12 Sept.	2 Sept.		10 Sept.
Cucumbers sowed	8 March	31 March		26 March	1 April	13 March	11 March	13 March	20 April
cut	9 June	15 June	5 July	1 July	22 June	8 June	11 June	25 June	29 June
Indian Corn sowed	10 May	10 May		6 May	8 May	4 May	24 May	19 May	12 May
pulled	21 August	19 August	12 August	22 August	16 August	25 August	19 August	2 Sept.	23 Aug.
Parsnips sowed	30 April	24 April		5 May		27 April	24 May	23 May	17 May
pulled	2 Nov	October		25 October		24 October	2 Nov.	30 October	
Peas sowed	16 April	22 April		3 May	17 April	8 April	1 May	27 April	1 May
picked	13 July	9 July	5 July	10 July	14 July	12 July	6 July		10 July
Potatoes forced, in frame		31 March		23 March	17 March	20 March	18 March	24 March	19 March
dug		15 June		7 June	1 June	30 May	1 June	13 June	30 May
planted in open air	20 April	22 April		10 April	27 April	19 April	1 May		14 May
dug	15 July	20 August	8 July	16 July	15 July	10 July	6 July		10 July
Radishes in frame		31 March		23 March	17 March	20 March	18 March	26 March	19 March
pulled				6 May	24 April	21 April	21 April	1 May	26 April
Rhubarb forced	14 March	6 March		6 March	14 March	8 March	12 Feb.	20 Feb.	4 Jan.
pulled	18 April	18 April		14 April	15 April	8 April	23 March	15 March	11 Feb
Sa. in open air		23 May				24 May			

Synopsis of Dates of Sowing and Gathering, Mount Rundell, Albion Mines.

Radishes in frame	15 July	20 August	8 July	16 July	15 July	10 July	6 July		10 July
pulled		31 March		23 March	17 March	20 March	18 March	26 March	19 March
Rhubarb forced				6 May	24 April	21 April	21 April	1 May	26 April
pulled	14 March	6 March		6 March	14 March	8 March	12 Feb.	20 Feb.	4 Jan.
In open air	18 April	18 April		14 April	15 April	8 April	23 March	15 March	11 Feb
		23 May				24 May			

Synopsis of Dates of Sowing and Gathering, Mount Rundell, Albion Mines.

FARM.	1844.	1845.	1846.	1847.	1848.	1849.	1850.	1851.	1852.
Barley sowed	6 June	6 June					18 June	4 June	29 May
reaped			18 August					9 September	17 August
yield			11½ to 1					24 to 1	26½ to 1
Buckwheat sowed							17 June	7 June	5 June
reaped							2 September	27 August	23 August
yield							46 to 1	24 to 1	32 to 1
Hay mowed	17 July	15 July	13 July	20 July	18 July	12 July	15 July	12 July	12 July
Mang. Wurtzel sowed	13to24 May	6 to 26 May	9 June	26 May	23 May	9 May	27 May	19 May	18 May
pulled	4 Novem.	Oct.	30 October	2 Nov.	9 October	17 October	15 October	23 October	not pulled
yield	800 b.pr.ac.	792b. pr.ac.	1052 b pr ac	888b. pr.ac.	870 b. pr. ac	210 bus.	220 bus.	467 b. pr. ac.	
Oats sowed	24 June								30 May
reaped	7 Sept.								28 August
yield	cut green								19½ to 1
Potatoes planted	23May 5 Ju	17to23 May		17 May	26 May	18 May	7 June	8 June	26 May 5 Jun
dug	12 October		16 Sept.	4 October	26 A to 25 S	14 A to 21 S	6 to 27 Sept.	15 S. to 3 Oct	10 to 30 Sept.
yield	5 or 12 to 1		5 or 12 to 1	1 or 6 to 1	2 or 14 to 1	9 or 13 to 1	9 or 12 to 1	11 or 15 to 1	10 to 1
Rye sowed								4 June	12 May
reaped								22 September	6 August
yield									24 b. per acre
Turnips sowed	15 June	18 June	13 June	2 June	30 May	11 May	7 June	10 June	20 May
pulled	2 Nov.	27 Sept.	26 Oct.	25 October	12 October	8 Nov.	2 November	4 November	not yet pulled
yield	144 b. pr.ac.	440 b. pr. ac	171 b. pr. ac	328 b. pr.ac	400 b. pr. ac	330 b. pr. ac	452 b. pr. ac.	500 b. pr. ac.	
Wheat sowed	10 May	22Ap 17 My		10 May	11 May	7 May	13 May	13 May	12 May
reaped	3 Sept.	20 Aug.	12 August	26 August	25 August	14 August	14 August	2 September	10 August
yield	8 to 1	17 to 1	10½ to 1	6 to 1	12 to 1	10 to 1		12½ to 1	not cleaned
Black Sea ditto, sowed									29 May
reaped									2 September
yield									12 to 1

Periods of Vegetation compared with different seasons, Albion Mines.

CLIMATE.	New Brunswick, by Prof. Johnston.	Scotland, by H. Stevens.	1848.	1849.	1850.	1851.	1852.
Mean temperature of May			50.35	43.60	48.30	46.60	50.65
" " June			57.50	55.65	57.80	54.25	59.00
" " July			68.00	68.85	66.80	66.10	67.80
" " August			67.90	65.55	63.90	60.90	65.00
" " September			54.90	56.55	58.40	55.60	57.50
" " of the season			59.75	57.84	59.04	56.69	59.99
Frosty nights in these months			13	35	18	30	26
Days of snow in May				2	2	4	2
Hot days above 70 degrees			78	80	76	70	99
Nights of rain.			18	17	38	22	19
Days of do.			55	34	43	50	42
Total days of do.	39, average of 5 years	27	7	51	81	72	61
Quantity of do. in inches			22 304	8.138	18.447	16.664	11.973
Days of lightning or thunder			16	10	22	16	19
PLANTS.							
Barley sowed	10 May to 15 June	April and May				June	29 May
reaped	20 Aug. to 25 Sept.					9 September	17 August
yield		12 or 20 to 1				24 to 1	26¼ to 1
do. per acre	average 29 b. per acre.	36 to 60 b. pr. ac.				38 bus. per acre	36¼ bus. pr. ac.
days in ground	96					97	80
average temperature		46.4 to 49				61.25	63.5
total degrees of do.						5933.5	5083°

Periods of Vegetation compared with different seasons, Albion Mines.

PLANTS.	New Brunswick, by Prof. Johnston	Scotland by H. Stevens.	1848.	1849.	1850.	1851.	1852.
Wheat sowed	10 May to 15 June	April and May				June	29 May
reaped	20 Aug. to 25 Sept.					9 September	17 August
yield		12 or 20 to 1				24 to 1	26¼ to 1
do. per acre	average 29 b. per acre.	36 to 60 b. pr. ac.				38 bus. per acre	36¼ bus. pr. ac.
days in ground	96					97	80
average temperature		46.4 to 49				61.25	63.5
total degrees of do.						5933.5	5083°
Potatoes planted	10 May to 15 June	April and May				June	29 May
dug	20 Aug. to 25 Sept.					9 September	17 August
yield		12 or 20 to 1				24 to 1	26¼ to 1
do. per acre	average 29 b. per acre.	36 to 60 b. pr. ac.				38 bus. per acre	36¼ bus. pr. ac.
days in ground	96					97	80
average temperature		46.4 to 49				61.25	63.5
total degrees of do.						5933.5	5083°
Turnips sowed	10 May to 15 June	April and May				June	29 May
reaped	20 Aug. to 25 Sept.					9 September	17 August
yield		12 or 20 to 1				24 to 1	26¼ to 1
do. per acre	average 29 b. per acre.	36 to 60 b. pr. ac.				38 bus. per acre	36¼ bus. pr. ac.
days in ground	96					97	80
average temperature		46.4 to 49				61.25	63.5
total degrees of do.						5933.5	5083°
Carrots sowed	10 May to 15 June	April and May				June	29 May
reaped	20 Aug. to 25 Sept.					9 September	17 August
yield		12 or 20 to 1				24 to 1	26¼ to 1
do. per acre	average 29 b. per acre.	36 to 60 b. pr. ac.				38 bus. per acre	36¼ bus. pr. ac.
days in ground	96					97	80
average temperature		46.4 to 49				61.25	63.5
total degrees of do.						5933.5	5083°
Parsnips sowed	10 May to 15 June	April and May				June	29 May
reaped	20 Aug. to 25 Sept.					9 September	17 August
yield		12 or 20 to 1				24 to 1	26¼ to 1
do. per acre	average 29 b. per acre.	36 to 60 b. pr. ac.				38 bus. per acre	36¼ bus. pr. ac.
days in ground	96					97	80
average temperature		46.4 to 49				61.25	63.5
total degrees of do.						5933.5	5083°
Beets sowed	10 May to 15 June	April and May				June	29 May
reaped	20 Aug. to 25 Sept.					9 September	17 August
yield		12 or 20 to 1				24 to 1	26¼ to 1
do. per acre	average 29 b. per acre.	36 to 60 b. pr. ac.				38 bus. per acre	36¼ bus. pr. ac.
days in ground	96					97	80
average temperature		46.4 to 49				61.25	63.5
total degrees of do.						5933.5	5083°
Onions sowed	10 May to 15 June	April and May				June	29 May
reaped	20 Aug. to 25 Sept.					9 September	17 August
yield		12 or 20 to 1				24 to 1	26¼ to 1
do. per acre	average 29 b. per acre.	36 to 60 b. pr. ac.				38 bus. per acre	36¼ bus. pr. ac.
days in ground	96					97	80
average temperature		46.4 to 49				61.25	63.5
total degrees of do.						5933.5	5083°

days in ground	96					97	80
average temperature		46.4 to 49				61.25	63.5
total degrees of do.						5938.5	5063°

Periods of Vegetation compared with different seasons, Albion Mines.

PLANTS.	New Brunswick, by Prof. Johnston.	Scotland by H. Stevens.	1848.	1849.	1850.	1851.	1852.
Buckwheat sowed	1 to 30 June	June			17 June	7 June	6 June
reaped	1 to 25 September	September			2 Sept.	27 August	23 August
yield		10 to 23 to 1			46 to 1	24 to 1	32 to 1
do. per acre	average 33 bs. per acre	20 to 46 b. p. acre			46 b. p acre	30 bus. per acre	35½ bus. per acre
days in ground	93	120			76	81	79
average temperature		46.4 to 49			65.2	61.9	63.8
total degrees of do.					4961°	5025°	5041°
Potatoes planted	10 April, to 20 June	March and April	26 May	18 May	7 June	3 June	26 May
dug	Sept. and October	October	26 Oct.	14 Aug.	6 Sept.	15 September	10 September
yield		10 to 1	3 to 1	8 to 1	12 to 1	5 to 1	9.5 to 1
do. per acre	average 226 b. per acre	av. 240 b. per acre					190 bus. per acre
days in ground	150	150	92	88	91	104	107
average temperature		46.4 to 49	64°	60.5	63 7	61	63
total degrees of do.			5910°	5327°	5798°	6337.5°	6745°
Wheat sowed	15 April to 1 June	8 to 26 March	11 May	7 May	12 May	13 May	12 May
reaped	10 August to 20 Sept.	26 Aug. to 30 Sep.	25 Aug.	14 Aug.	14 Aug.	2 September	10 August
yield		12 to 1	12 to 1			12½ to 1	12 to 1
do. per acre	average 20 b. per acre	20 to 56 b. pr acre				25 bus. per acre	30 bus. per acre
days in ground	110	153 to 186	106	99	98	112	89
average temperature		46.4 to 49	62.3	58.4	60.9	58.8	61.75
total degrees of do.			6607°	5784°	5665°	6537°	5488°
Oats sowed	April and May	January					30 May
reaped	August and Sept.						8 August
yield		6, 12 to 1					39½ to 1
do. per acre	34 bushels per acre	36 to 72 b. pr acre					50 bus. per acre
average temperature		46.4 to 49					62.6
total degrees of do.							5637°
days in ground	110						90

RAIN AT THE ALBION MINES, upon an average of nine years, from June 1843, to June, 1852; divided into two seasons, for the information of the working farmer:—

	Nights.	*Days.*	*Quantity in Inches.*
December,	5.5	12	4.8198
Januar y,	5	11	3.3814
February,	4	9	3.2673
March,	4	10	4.3963
April,	4.3	8.3	2.6500

	Nights.	*Days.*	*Quantity.*
Total for five non-working months -	22.8	50.3	18.5148

	Nights.	*Days.*	*Quantity.*
May,	4	9.5	2.8976
June,	5	9	2.1338
July,	5	10	3.0052
August,	5	9	4.5006
September,	4	8	3.1520
October,	6	9	5.6016
November,	4.5	11	4.3984
Total for seven working months -	33.5	65.5	25.6892
Do. for the whole year - - -	56.3	115.8	44.2040

It does not commonly rain for the whole day; so that I do not think the farmer is prevented from pursuing the *work of the season*, at any time for more than three days in any one month.

☞ The above table, if properly studied by farmers, will give them a far more accurate idea of the amount of fine weather they have to expect in each month, than the oracular predictions in the almanacks.

2. CHEMICAL ANALYSIS.

The analysis of soils is a tedious and difficult operation, requiring, on the part of the operator, not only a large acquaintance with chemistry, but much skill and practice, pure chemical tests, and somewhat expensive apparatus. Neither the farmer nor the teacher can, therefore, in ordinary circumstances, be an analytical chemist. Since, however, it may sometimes be desirable to ascertain, in a rude way, the general composition of soils and manure, I give here the following simple processes, principally from Professor Norton:

The mechanical texture of a soil is ascertained by simply washing with water. Dry the soil. Weigh a portion, say a pound or half

pound. Boil in water, and stir thoroughly. The sand will settle first, and, when it is at the bottom, the liquid alone—holding the clay, &c., in suspension—may be poured off into another vessel. A few repetitions of this will leave nothing but clean sand and gravel, if the soil contain any. This may be dried and weighed, and the quantity will indicate to which of the classes already referred to, (loams, clays, &c.,) the soil belongs. An examination of the small stones and coarser grains of sand, to ascertain whether these be granite, trap, sandstone, &c., may be useful in forming an estimate of the qualities of the soil.

The following course may be adopted, in case more information is desired, regarding the especial constituents of a soil :—

1. Take a weighed half pound or pound of the soil, and boil it in water for some hours; rain water is purest. Then pour it upon a filter of coarse, porous paper, of the kind that druggists use for their filtrations. The mode of managing this operation may be seen in any druggist's shop. If the liquid does not come through clear at first, it must be refiltered till it is quite clear. The solution thus obtained is evaporated to dryness, and the solid residue burned. It will blacken at first, by the burning of its organic matter, but afterwards will become white again.

a. It may now be weighed on a small apothecaries' balance, and the weight gives the per-centage of inorganic matter soluble in water, that exists in the soil.

b. This portion consists, in many soils, for the most part, of sulphates or carbonates of potash and soda. There is also commonly present some chloride of sodium, or common salt.

These are all valuable constituents of a soil; and hence, when an experiment of this kind shows such soluble matter to abound, it may be inferred that the soil is well supplied with an important portion of its requisite substances.

c. The part soluble in water is commonly not large; it amounts to not more than from one to three per cent. in many excellent soils.

2. Take another weighed portion of soil, or the same which has already been boiled in water, and heat it with some muriatic acid, (hydrochloric acid), diluted by two or three times its bulk of water. After standing a few hours, put this also upon a filter, and wash the acid liquid through.

a. Wash the residue upon the filter, with successive portions of clear water, until it no longer tastes acid; it may then be burned until all of the organic part is consumed, and weighed when it is cool. This weight gives the per-centage of insoluble silicious matter in the soil.

b. To the filtered acid solution is first added ammonia (common aqua ammoniæ), till it is no longer acid but alkaline; a flocculent

precipitate then immediately falls, being iron and alumina. If it is of a deep red color, then iron predominates, and the contrary, if it is nearly white. If the precipitate has a whitish green color, and reddens when exposed to the air, then the soil contains the protoxide of iron, in place of the peroxide. The first, it will be remembered, was spoken of on page 28, as injurious to plants. It is, for this reason, important to know which oxide is present.

If it is shown by the above test to be the protoxide, the solution must be boiled again, with the addition of a little nitric acid; this will convert all of the iron into protoxide, and it will thus remain upon the filter; the protoxide would have been partially washed through. Another filtering is now necessary. This should be done as soon as the precipitate has settled, and while the liquid is warm, so that it may filter more rapidly. The whole operation should be done in the shortest practicable time, and the liquid covered, as far as possible, from access of air.

From the apparent quantity of the iron and alumina, as weighed after burning, may be judged with tolerable accuracy the proportion present in the soil.

c. If the soil contained much lime, an effervescene would have been seen at first, when the acid was added; this is supposing the lime contained to be carbonate, or in combination with carbonic acid, that being the most common form. If it is not present as carbonate, or if this is in so small quantity as not to show any action with acid, there are still means for its easy and certain detection. To the solution previously rendered alkaline by ammonia, and already filtered to separate iron and alumina, is to be added a little common oxalic acid. If there be even the smallest weighable quantity of lime present, a white, powdery precipitate will begin to fall; from the quantity of this may be estimated, roughly, the proportion of lime in the soil.

All of the above important points, it will be noticed, may be determined without any necessity for expensive materials or apparatus, by a person of ordinary intelligence. Easy as those things seem, however, in the description, so many difficulties will be found in practice, as will give the operator some conception of the care and study involved in a complete and detailed analysis; one by which it is intended to ensure the greatest possible degree of accuracy.

I have not mentioned any tests for the presence of phosphoric acid, and other of the less abundant substances; because their detection and separation are so difficult, that the inexperienced beginner would only run into every description of error, while looking for them.

It is not a hard matter for the farmer to arrive at the probable value of a marl, with quite a tolerable degree of accuracy. A weighed portion must be taken, and diluted muriatic acid added, from time to time, until all effervescence has ceased. The mixture is then boiled,

or at least well heated, and thrown upon a filter. The insoluble residue which remains upon the filter, must be washed clean from acid, dried and weighed; this is chiefly silica. Its weight, subtracted from the original weight taken, will, in most cases, give nearly the amount of carbonate of lime that has been dissolved out by the acid. Small quantities of other substances have been dissolved at the same time, which have been mentioned in a previous chapter, as important to the value of the marl; but they are only to be separated by an instructed chemist."

The presence of gypsum in a marl, &c., may be ascertained in the following manner:—Stir a portion of the substance in water, and allow it to stand for a few hours. Then filter off the water, and add a few drops of solution of nitrate of baryta. If gypsum be present, a white powder will fall to the bottom, and the quantity of gypsum present may be estimated from its amount.

"The foregoing instances are of a nature so simple as to be easily understood, and are sufficient so show that the farmer, without becoming a chemist, may still make some valuable experiments for his own satisfaction, and this with such means as are to be found in any country village.

"I might multiply cases of the same nature to an indefinite extent; but, as this is not an extended treatise upon analytical chemistry, the above illustrations are sufficient for the present purpose.

"One great end will be attained by all who go through such examinations as these, or who experiment upon the various substances mentioned in the previous portions of this essay. They will soon familiarize themselves to such an extent with chemical phenomena and terms, that they will be able, far more readily and perfectly than ever before, to comprehend the writings and discoveries of scientific men, and to draw from them truths profitably applicable to their own pursuits."

APPENDIX B.

The substance of the following extract, which it is thought may be of general interest and utility, is from a report made in 1853, to His Grace the Duke of Newcastle, then Secretary of State for the colonies, by His Excellency the Lieutenant-Governor, Sir J. Gaspard Le Marchant, "on the State, Resources and Capabilities, of the Province of Nova Scotia."

As its republication is designed to convey the latest information, it has been modified in accordance with subsequent changes or altered circumstances. Its original epistolatory form has been abandoned. It contains interesting facts, and comparative statements, which will serve to illustrate the actual condition of the colony.

In Canada, the advalorem duty on imports is 12½ per cent.; in New Brunswick it ranges from 7½ to 30 per cent.; but in Nova Scotia it is only 6½ per cent. on a large proportion of the articles to which the preceding rates refer.

The following is a comparative statement of our revenues from 1850 to 1854, inclusive, viz :

In 1850,	£76,417	Sterling.
1851,	86,501	"
1852,	88,000	"
1853,	100,000	"
1854,	126,400	"

Public debt of Nova Scotia, 31st December, 1854, (on interest, at 4 per cent,) Sterling,	£56,200	0	0
Provincial paper afloat, not paying interest,	55,889	10	0
	£112,089	10	0

Expended on Government Railroads, up to 31st December, 1854, £41,000 0 0

There are forty-seven Free Ports in Nova Scotia, at which Officers are appointed, and which enjoy equal privileges for conducting domestic and foreign commerce. Tables hereafter referred to, exhibit in detail the extent and value of the trade of each of them with Great Britain, the British North American Colonies, the United States and other countries, for the year 1854.

The abstracts of that trade are as follows, viz. :—

COUNTRIES.	VALUE OF IMPORTS. *Sterling.*	VALUE OF EXPORTS. *Sterling.*
Great Britain,	£636,885	£117,844
B. N. A. Colonies,	329,612	513,026
British West Indies,	30,133	270,750
United States,	575,288	318,676
Other countries,	219,164	127,372
Total,	£1,791,082	£1,247,668

The following are comparative totals of above trade, for the last three years, viz :—

	VALUE OF IMPORTS.	VALUE OF EXPORTS.
For 1852,	£1,194,175	£970,780
1853,	1,417,086	1,078,707
1854,	1,791,082	1,247,668
Total increase in 1854 over 1852,	596,907	276,888

The preceding do not include " Ships exported," the value of which in 1853, amounted to £153,121 sterling, and in 1854, to £143,503 sterling. The addition of these sums would make the total amount of exports, for 1853, £1,231,828, and that for 1854, £1,391,171.

The subjoined tables, A and B, exhibit in detail the imports and exports for 1854, and show, also, the value of domestic productions exported from the Province, in that year, to have been upwards of £1,000,000 sterling.

The results are comprised under the following heads, viz.:

1. AGRICULTURAL.

	VALUE IMPORTED.	VALUE EXPORTED.	EXCESS OF EXPORTS.
Apples,	£210	£7,188	£6,978
Butter,	2,604	20,219	17,615
Cheese,	87	2,548	2,461
Eggs,		1,172	1,172
Horned Cattle,		26,016	26,016
Horses,		3,121	3,121
Pork,	10,020	14,468	4,448
Potatoes,	6,328	54,382	48,054
Sheep,		4,746	4,746
Total	£19,249	£133,860	£114,611

2. FISHERIES.

	VALUE IMPORTED. *Sterling.*	VALUE EXPORTED. *Sterling.*	EXCESS OF EXPORTS. *Sterling.*
Alewives,	£———	£3,818	£3,818
Codfish,	57,778	195,085	137,307
Herrings,	26,685	78,960	52,275
do., smoked,		6,059	6,059
Mackerel,	427	194,062	193,635
Shad and Salmon,	8,195	16,057	7,862
Scale Fish,	1,615	2,974	1,359
Oil,	8,042	24,410	16,368
Total	102,742	521,425	418,683

3. "THE FOREST."

	VALUE OF IMPORTS. *Sterling.*	VALUE OF EXPORTS. *Sterling.*	EXCESS OF EXPORTS. *Sterling.*
Lumber,	£1,618	£135,596	£133,978
Shingles,	2,442	5,713	3,271
Spars & Knees,		9,562	9,562
Timber,		14,941	14,941
Wood,		80,577	80,577
Furs,		8,799	8,799
Staves and Hoops,		20,848	20,848
Total	4,060	226,036	221,476

4. MINES AND MINERALS.

EXPORTED.	VALUE
Gypsum,	£14,987 Stg.
Coal,	87,700
Total	102,687

RECAPITULATION.

	VALUE OF EXCESS OF EXPORTS.
Agricultural products,	£144,611
Fishery do.,	418,683
Forest do.,	221,476
Mines and Minerals,	102,687
Add value of Ships exported,	143,503
	1,000,960

These results, relatively to population, nearly equal the exports of domestic productions and manufactures from Great Britain and Ireland, and exceed those of the United States and Canada, as appears from the following statement:—

	POPULATION.		YEAR.	PER HEAD OF POPULATION.
G. B. and Ireland,	28,000,000	£98,933,781	1853	£3 10 0
United States,	25,000,000	50,409,561	1854	2 0 0
Canada,	2,000,000	5,950,325	1853	2 19 0
Nova Scotia,	290,000	1,000,960	1854	3 9 0

Tables C and D, appended, show the imports and exports for 1854, relatively, to different ports of export and import.

The following tables prove that Nova Scotia, though importing breadstuffs to a large extent, exports, in proportion to her population, a larger amount of food than the United States or Canada.

Food Exported from Nova Scotia, in the Year ending 31st December, 1854.

Agricultural products,	£114,611	
Less value of Horses,	3,121	
		111,490
Fishery products,	418,683	
Less value of Oil,	16,368	
		402,315
Total value		£513,805

Food Exported from the United States, in the Year ending 30th June, 1854.

ANIMALS.

Beef and Horned Cattle, including Tallow and Hides,	$2,757,022
Butter and Cheese,	1,258,393
Pork, (pickled), Bacon, Lard, Live Hogs,	11,061,016
Sheep,	15,194
Total value of Animals	$15,091,625

VEGETABLES.

Wheat,	$12,420,172
Flour,	27,701,444
Indian Corn,	6,074,277
Indian Meal,	1,002,976
Rye Meal,	112,703
Rye, Oats, other small grain and Pulse,	576,195
Biscuit, or Ship Bread,	495,340
Potatoes,	121,680
Apples,	51,766
Rice,	2,634,127
Total value of Vegetables	$51,190,680

FISH.

Dried or Smoked Fish,	$389,973
Pickled Fish,	162,187
Total value of Fish	$552,160
Sum of total value of articles so exported from the United States, for food,	$66,836,465
Or, Sterling,	£13,367,293

Food Exported from Canada, in the Year 1853.

Animals and their produce,	£342,621
Vegetables,	1,995,094
Produce of the Sea,	85,000
Total value of articles so exported for food, from Canada,	£2,422,715

RECAPITULATION.

		PER HEAD OF POPULATION.
Value of food exported from Nova Scotia,	£513,805	£1 15 4
From United States,	13,367,293	0 10 8
Canada,	2,422,715	1 4 3

Referring to productions of Shipyards and Fisheries, Nova Scotia exhibits the following comparative relation to the United States and Canada, respectively, viz. :—

1. SHIPYARDS.

	Number.	*Tonnage.*
(*a*.) Ships built in Nova Scotia in the year 1854,	244	52,844
Do. built in the United States in year ending 30th June, '54,	1,774	535,636
Do. do. Canada, in 1853,	138	59,070

NOTE.—In only three of the States of the Union, viz., Maine, New York, and Massachusetts, was there a greater amount of shipping built in the period above mentioned, than in Nova Scotia.

2. FISHERIES.

The whole annual produce of the Fisheries of the United States is estimated at $10,000,000; whilst Nova Scotia, in 1854, after supplying the home consumption, exported $2,093,415, in value, or more than 1-5th of the value of the whole product of the fisheries of the 25,000,000 inhabitants of the American republic.

While the Gulf of St. Lawrence and the Northern parts of New Brunswick, are frozen up during four or five months of winter, the whole frontage of Nova Scotia upon the Atlantic, indented by the finest harbors in the world, is open to a profitable commerce throughout the year.

Availing itself of these natural advantages, the growth of the mercantile marine of Nova Scotia has been so extraordinary in the past, as to prove itself destined, at no distant future, to become one of the largest ship-owning countries in the world. Even now a comparison of her condition, in relation to this branch of industry, with many of the old maritime countries of Europe, and with the United States of America, would exhibit very striking results.

It is also in advance of many of the States of the Union in the production of the necessaries of life, by the successful cultivation of the soil.

With the wheat growing countries which surround the Great Lakes, whether on the British or American side of the line, Nova Scotia is not to be compared. She does not raise her own bread, but, while one barrel of her Mackerel will purchase two barrels of Flour, she can always afford to buy what she requires. It is curious, however, to discover that, even as a wheat growing country, she surpasses five of the New England States, and twelve of the more recently settled States and Territories.

(*a*) See Table Appended.

WHEAT CROP.

Wheat raised in Nova Scotia, in 1851,—297,157 bushels.

	Bushels.		*Bushels.*
State of Maine,	296,259	Louisiana,	417
New Hampshire,	185,658	Texas,	41,198
Massachusetts,	31,211	Arkansas,	199,639
Rhode Island,	49	California,	17,321
Connecticut,	41,726	Minesota Territory,	1,401
District of Columbia,	17,370	Oregon "	211,943
Florida,	1,027	Utah "	107,702
Alabama,	294,040	New Mexico	196,517
Mississippi,	137,990		

By reference to the following return, it will be seen that, in the growth of Rye, Nova Scotia exceeds sixteen of the neighboring States and Territories. In the production of Indian Corn, (though the quality raised in this Province is excellent), most of the United States surpass Nova Scotia; but yet, in the growth of Oats, she excels thirteen, in Buckwheat twenty-three, and in Barley every State and Territory in the Union, except Ohio and New York.

RYE CROP.

Rye raised in Nova Scotia, in 1851,—67,438 bushels.

	Bushels.		*Bushels.*
Rhode Island,	26,409	Louisiana,	475
Delaware,	8,066	Texas,	3,108
District of Columbia,	5,509	Arkansas,	8,047
South Carolina,	43,790	Missouri,	44,268
Georgia,	53,750	Iowa,	19,916
Florida,	1,152	Minesota Territory,	125
Alabama,	17,261	Oregon "	106
Mississippi,	9,606	Utah "	210

OATS.

Oats raised in Nova Scotia, in 1851,—1,384,437 bushels.

	Bushels.		*Bushels.*
New Hampshire,	973,381	Texas,	178,883
Rhode Island,	215,232	Arkansas,	656,183
Connecticut,	1,258,738	Minesota Territory,	30,582
Delaware,	60,451	Oregon "	65,146
Columbia District,	8,134	Utah "	10,900
Florida,	66,586	New Mexico "	5
Louisiana,	26,878	California,	

BUCKWHEAT.

Buckwheat raised in Nova Scotia, in 1851,—17[illegible]01 bushels.

	Bushels.		*Bushels.*
Maine,	104,523	Louisiana,	3
New Hampshire,	65,265	Texas,	59
Massachusetts,	105,895	Arkansas,	175
Rhode Island,	1,245	Tennessee,	19,427
Delaware,	8,615	Kentucky,	16,097
Maryland,	103,671	Missouri,	23,641
District of Columbia,	378	Iowa,	52,516
North Corolina,	16,704	Wisconsin,	79,878
South Carolina,	283	Minesota Territory	515
Florida,	55	Utah "	332
Alabama,	348	New Mexico "	100
Mississippi,	1,121		

BARLEY.

Barley raised in Nova Scotia, in 1851,—196,097 bushels.

	Bushels.		*Bushels*
Maine,	151,731	Louisiana,	[illegible]
New Hampshire,	70,256	Texas,	4,776
Vermont,	42,150	Arkansas,	177
Massachusetts,	112,385	Tennessee,	2,737
Rhode Island,	18,875	Kentucky,	95,343
Connecticut,	19,090	Michigan,	75,249
New Jersey,	6,492	Indiana,	45,483
Pennsylvania,	165,584	Illinois,	110,795
Delaware,	56	Florida,	
Maryland,	745	Missouri,	9,361
District of Columbia,	75	Iowa,	25,093
Virginia,	25,437	California,	9,712
North Carolina,	2,735	Minesota Territory,	1,216
South Carolina,	4,583	Oregon "	
Georgia,	11,501	Utah "	1,799
Alabama,	3,958	New Mexico "	5
Mississippi,	229		

In the growth of Hay, and in the produce of the Dairy, the following Returns show that only the older, larger, and more populous of the United States are in advance of this Province, while in the yield of Potatoes, of which there is a large quantity exported from Nova Scotia to the Republic, she leaves twenty-three of the States far behind her.

HAY CROP.

Hay raised in Nova Scotia, in 1851,—287,837 Tons.

	Tons.		*Tons.*
Rhode Island,	73,353	Texas,	8,397
Delaware,	30,159	Arkansas,	3,924
Maryland,	145,070	Tennessee,	72,942
District of Columbia,	1,974	Kentucky,	115,296
North Carolina,	145,180	Missouri,	116,284
South Carolina,	25,427	Iowa,	84,598
Georgia,	23,497	California,	2,638
Florida,	2,690	Minesota,	2,069
Alabama,	31,801	Oregon,	373
Mississippi,	12,517	Utah,	4,288
Louisiana,	20,672		

BUTTER.

Butter made in Nova Scotia, in 1851,—3,613,890 lbs.

	Lbs.		*Lbs.*
Rhode Island,	1,066,625	Iowa,	1,933,128
Delaware,	1,634,867	Wisconsin,	888,816
District of Columbia,	14,869	California,	705
South Carolina,	2,979,975	Minesota,	1,100
Florida,	375,853	Oregon,	211,734
Louisiana,	658,136	Utah,	74,064
Texas,	2,319,574	New Mexico,	101
Arkansas,	1,854,104		

CHEESE.

Cheese made in Nova Scotia, in 1851,—642,069 lbs.

	Lbs.		*Lbs.*
Rhode Island,	296,748	Georgia,	46,391
New Jersey,	500,819	Florida,	18,824
Delaware,	3,137	Alabama,	30,423
Maryland,	3,925	Mississippi,	20,314
Virginia,	434,850	Louisiana,	1,148
North Carolina,	95,043	Texas,	92,018
South Carolina,	4,810		

POTATOES.

Potatoes raised in Nova Scotia, in 1851,—1,986,789 bushels.

	Bushels.		*Bushels.*
Rhode Island,	651,029	Arkansas,	193,832
Delaware,	240,542	Tennessee,	1,067,844

	Bushels.		*Bushels.*
Maryland,	764,938	Kentucky,	1,492,487
Columbia District,	28,292	Missouri,	939,006
North Carolina,	620,318	Iowa,	276,120
South Carolina,	136,494	Wisconsin,	1,402,077
Georgia,	227,379	California,	9,292
Florida,	7,828	Minesota territory,	21,145
Alabama,	246,001	Oregon "	91,336
Mississippi,	261,482	Utah, "	43,968
Louisiana,	95,632	New Mexico "	3
Texas,	93,548		

Along the whole line of coast of British North America, which, including that portion lying between Cape St. John and Cape Ray, over which the French right of fishery extends, and also the indentations of bays and harbours, has been calculated to equal ten thousand miles, not to mention the Great Banks of Newfoundland, there is the finest fishery in the world. Cod, haddock, halibut, salmon, mackarel, herring and alewives abound.

The citizens of the Union have been lately admitted, by treaty sanctioned by the Legislature, to a participation in these fisheries; but as nature has supplied their stores in inexhaustible abundance—as the community of privilege thus ceded has been met on the part of our republican neighbors by an admission into their ports, free of duty, of the most valuable agricultural and mineral productions of the province, and as the industry, ingenuity and enterprise of our fishermen may be estimated as at least equal to those of the citizens of the United States, whose competition they must encounter, it may be assumed that Nova Scotia will never have cause to regret the concession which she has thus made.

The political condition of Nova Scotia is quite as much advanced as its industrial. The Province enjoys, in common with Canada and New Brunswick, the full developement of representative institutions. Each branch of the Legislature is guided by British precedents. In the courts, the law and practice of England prevail. The press is free, and even its licentiousness is unrestrained by any check unfamiliar to the inhabitants of the Mother Country. The public servants hold their offices by tenures sanctioned by Imperial practice; and the modes of administration, while they secure to the Queen's Representative the aid of a Parliamentary majority, and of able men to preside over the public departments, leave him free to discharge the duties which he owes to Her Majesty, by the constitutional exercise and preservation of all the prerogatives of the crown.

TABLES REFERRED TO IN THE FOREGOING STATEMENT.

Abstract of the principal articles of British and Foreign Merchandize imported into the province of Nova Scotia during the year ended 31st December, 1854, shewing the value of each article, and from what country imported.

Articles.	Total of imports			Imported from											
	Quantity.		Value.	Great Britain.		British Colonies.				United States.			Other countries.		
						North America			West Indies.						
Ale and Porter,			£2102 0 0	£2025	0 0	£77	0	0							
Arms and Ammunition,			858 0 0	795	0 0	55	0	0		8	0	0			
Apples,			210 0 0			7	0	0		203	0	0			
Beef,	Bbls.	3092	5191 0 0			1610	0	0		3581	0	0			
Brandy,	Galls.	38357	13561 0 0	3183	0 0	1924	0	0		748	0	0	7756	0	0
Bread,			11312 0 0			1440	0	0		9624	0	0	248	0	0
Burning Fluid,		17482	2678 0 0			7	0	0		2671	0	0			
Butter,			2604 0 0			2012	0	0		480	0	0	112	0	0
Cabinet Wares,			3805 0 0			118	0	0		3687	0	0			
Candles,			1026 0 0	16	0 0	114	0	0		894	0	0			
Coffee,	Lbs.	102686	3300 0 0			6	0	0	492 0 0	1924	0	0	878	0	0
Cheese,			87 0 0			2	0	0		85	0	0			
Clocks,			1152 0 0			129	0	0		1023	0	0			
Corn and Wheat,	Bush.	69752	16097 0 0			2 79	0	0		13918	0	0			
Cornmeal and Oatmeal,	Bbls.	57003	51901 0 0			4272	0	0		47649	0	0			
China and Earthenware,			2194 0 0	691	0 0	1378	0	0		115	0	0	10	0	0
Codfish,	Qtls.	94230	57778 0 0			57778	0	0							
Cordage,			22176 0 0	5582	0 0	2607	0	0		1181	0	0	2177	0	0
Cotton Manufactures,*			627605 0 0	558879	0 0	27512	0	0		40778	0	0	336	0	0
Drugs & Apothecaries' ware			11540 0 0	587	0 0	535	0	0		10418	0	0			
Fishing Tackle,			1856 0 0	53	0 0	412	0	0		1183	0	0	208	0	0
Flour, (Wheat,)	Bbls.	188162	306576 0 0			98989	0	0		207241	0	0	345	0	0
Flour, (Rye,)		10873	14514 0 0			295	0	0		14219	0	0			
Fruit,			11553 0 0			122	0	0	1591 0 0	3136	0	0	6704	0	0
Geneva and Whiskey,	Galls.	31114	6462 0 0	5136	0 0	77	0	0					1249	0	0
Glassware,			2385 0 0	15	0 0	318	0	0		2052	0	0			
Hardware and Cutlery,			36902 0 0	1814	0 0	6286	0	0		28085	0	0	718	0	0
Hats and Caps,			5364 0 0	217	0 0	117	0	0		5030	0	0			
Herrings,	Bbls.	58763	26685 0 0			26570	0	0							
Hides and Skins,			6557 0 0			4232	0	0	200 0 0	767	0	0	1358	0	0
Iron and Ironmongery,			38710 0 0	23580	0 0	8196	0	0	137 0 0	6797	0	0			

Fishing Tackle,			1856	0	0	53	0	0	412	0	0								
Flour, (Wheat,)	Bbls.	188162	306576	0	0				92989	0	0				207241	0	0	345	0 0
Flour, (Rye,)		10873	14514	0	0				295	0	0				14219	0	0		
Fruit,			11553	0	6				122	0	0	1591	0	0	3136	0	0	6704	0 0
Geneva and Whiskey,	Galls.	31114	6462	0	0	5136	0	0	77	0	0							1249	0 0
Glassware,			2385	0	0	15	0	0	318	0	0				2052	0	0		
Hardware and Cutlery,			36902	0	0	1814	0	0	0285	0	0				28085	0	0	718	0 0

Hats and Caps,			5364	0	0	217	0	0	117	0	0				5030	0	0		
Herrings,	Bbls.	58763	26685	0	0				26570	0	0							115	0 0
Hides and Skins,			6557	0	0				4232	0	0	200	0	0	767	0	0	1358	0 0
Iron and Ironmongery,			38710	0	0	23580	0	0	8196	0	0	137	0	0	6797	0	0		
Linen & Woollen manufrs.			23557	0	0	5369	0	0	12584	0	0				5521	9	0	83	0 0
Leather & leather manfrs.			24824	0	6	729	0	0	686	0	0				23228	0	0		
Lard and Tallow,			7933	0	0				117	0	0				7816	0	0		
Lumber,			1618	0	0				917	0	0				701	0	0		
Mackerel,	Bbls.	307	427	0	0				427	0	0								
Molasses,	Gals.	2258646	92517	0	0				4294	0	0	8593	0	0	1749	0	0	77881	0 0
Oakum,			2454	0	0	299	0	0	871	0	0				1284	0	0		
Oil, (Seal and Fish,)			8042	0	0				7677	0	0				365	0	0		
Oil, (other kinds,)			2677	0	0	422	0	0	510	0	0				1141	0	0	604	0 0
Oats and Barley,	Bush.	94370	8598	0	0				8598	0	0								
Paper manufactures, Books & Stationery			10165	0	0	648	0	0	178	0	0				9339	0	0		
Paint,			1631	0	0	353	0	0	912	0	0				287	0	0	79	0 0
Pork and Hams,			10020	0	0	101	0	0	348	0	0				9571	0	0		
Potatoes and Vegetables,	Bush.	62050	6328	0	0				4899	0	0	93	0	0	1336	0	0		
Rice,			5160	0	0	918	0	0	228	0	0				3988	0	0	26	0 0
Rum,	Galls.	97673	10252	0	0	71	0	0	384	0	0	2680	0	0	3322	0	0	3795	9 0
Salt,	Tons	42016	36667	0	0	8386	0	0	7355	0	0	5967	0	0	574	0	0	14385	0 0
Scale Fish, &c.			1615	0	0				1364	0	0				251	0	0		
Salmon,	Bbls.	3030	8195	0	0				8195	0	0								
Shingles,	M	9099	3442	6	0				3426	0	0				16	0	0		
Soap,			1322	0	0	130	0	0	168	0	0				1018	0	0	6	0 0
Sugar,	Lbs.	6813123	59859	0	0				3073	0	0	8736	0	0	2083	0	0	6 967	0 0
Tea,		1230788	71483	0	0	11409	0	0	2331	0	0				32597	0	0	25126	0 0
Tobacco,			23034	0	0	37	0	0	530	0	0				21621	0	0	846	0 0
Wine,	Galls.	16731	10035	0	0	2013	0	0	1851	0	0				1238	0	0	4923	0 0
Wood Wares and Agricultural Implements,			13474	0	0	7	0	0	1291	0	0	759	0	0	9514	0	0	1903	0 0
Miscellaneous,			30643	9	0	2470	0	0	6942	0	0	900	0	0	18616	0	0	135	0 0
Totals,			£1791082	0	0	£636885	0	0	£329612	0	0	£58133	0	0	£575288	0	0	£219164	0 0

* This includes all British manufactures in the port of Halifax.

SAM'L. CREELMAN, Financial Secretary.

Abstract of the principal articles Shipped from the Province of Nova Scotia during the year ended 31st December, 1854, shewing the value of each article, and to what Countries exported.

Articles.	Total of Exports.		Exported to				
	Quantity.	Value.	Great Britain	British Colonies. North America.	British Colonies. West Indies.	United States.	Other countries.
Apples and Plums,	Bush. 50260	£7188 0 0	£106 0 0	£6783 0 0	£42 0 0	£63 0 0	£194 0 0
Ale, Porter, and Cider,		3476 0 0		1013 0 0	1086 0 0	1257 0 0	120 0 0
Alewives,	Bbls. 6896	3818 0 0		48 0 0	2875 0 0	468 0 0	427 0 0
Beef,	1247	3291 0 0	361 0 0	2827 0 0	47 0 0		56 0 0
Brandy,	Galls. 18544	7940 0 0		7940 0 0			
Bread,		5099 0 0		5099 0 0			
Butter,		20219 0 0		14627 0 0	4306 0 0	82 0 0	1204 0 0
Cheese,	Lbs. 97470	2548 0 0		2526 0 0	17 0 0		5 0 0
Coals,	Tons 88621	47699 0 0		16078 0 0		31015 0 0	606 0 0
Codfish,	Qtls. 318448	195085 0 0	1440 0 0	13834 0 0	99812 0 0	10309 0 0	69690 0 0
Cotton & Woolen manuf'rs,		33576 0 0	50 0 0	28377 0 0	4924 0 0	2592 0 0	
Eggs,	Doz. 42673	1172 0 0		1116 0 0		50 0 0	6 0 0
Flour,	Bbls. 17271	29083 0 0		28939 0 0	60 0 0		84 0 0
Fruit, (foreign,)		4581 0 0		4461 0 0			120 0 0
Furs,		8797 0 0	8356 0 0	155 0 0		245 0 0	41 0 0
Geneva and Whiskey,		3160 0 0		3160 0 0			
Gypsum,	Tons 87283	14987 0 0		753 0 0		14234 0 0	
Hardware,		30992 0 0	300 0 0	25728 0 0	70 0 0	3939 0 0	955 0 0
Herrings,	Bbls. 121562	78970 0 0	1152 0 0	22492 0 0	32929 0 0	16599 0 0	5798 0 0
Do., (smoked,)		6059 0 0	2694 0 0	2578 0 0		710 0 0	77 0 0
Horned Cattle,	No. 2421	26016 0 0		25254 0 0	314 0 0		448 0 0
Horses,	93	3121 0 0		3101 0 0		20 0 0	
Leather & Leather manf'rs,		5125 0 0		5090 0 0	35 0 0		
Lumber, (sawed,)	F't 72662000	135596 0 0	54149 0 0	8674 0 0	50935 0 0	6815 0 0	15023 0 0
Mackerel,	Bbls. 168082	194062 0 0		14214 0 0	50682 0 0	121163 0 0	8003 0 0
Molasses,		43154 0 0	12090 0 0	30796 0 0			
Oats and Barley,	Bush. 29627	2336 0 0		2883 0 0	53 0 0		
Oils, (Fish and Seal),		24400 0 0	2190 0 0	6743 0 0	10274 0 0	3363 0 0	1830 0 0
Pork and Hams,	Bbls. 5035	14468 0 0	4576 0 0	9672 0 0	184 0 0		36 0 0
Potatoes and Vegetables,	Bush. 499484	54383 0 0		9454 0 0	1768 0 0	43161 0 0	

Do., (smoked,)			6059	0	0	2694	0	0	2578	0	0				710	0	0	77	0	0
Horned Cattle,	No.	2421	26016	0	0				25254	0	0	314	0	0				448	0	0
Horses,		93	3121	0	0				3101	0	0				20	0	0			
Leather & Leather manf'rs,			5125	0	0				5090	0	0	35	0	0						
Lumber, (sawed,)	F't	72662000	135596	0	0	54149	0	0	8674	0	0	50935	0	0	6815	0	0	15023	0	0
Mackerel,	Bbls.	168082	194062	0	0				14214	0	0	50682	0	0	121163	0	0	8003	0	0
Molasses,			43154	0	0	12090	0	0	30796	0	0									
Oats and Barley,	Bush.	29627	2336	0	0				2883	0	0	53	0	0						
Oils, (Fish and Seal),			24400	0	0	2190	0	0	6743	0	0	10274	0	0	3363	0	0	1830	0	0
Pork and Hams,	Bbls.	5035	14468	0	0	4576	0	0	9672	0	0	184	0	0				36	0	0
Potatoes and Vegetables,	Bush.	499484	54382	0	0				9454	0	0	1769	0	0	43124	0	0	35	0	0
Rum,	Galls.	68024	14602	0	0	1995	0	0	10772	0	0				835	0	0	1000	0	0
Salt,			4396	0	0				3796	0	0				600	0	0			
Scale Fish,			2974	0	0				1348	0	0	75	0	0	726	0	0	825	0	0
Shad and Salmon,			16087	0	0	396	0	0	59	0	0	3220	0	0	11888	0	0	494	0	0
Sheep,	No.	8950	4746	0	0				4675	0	0							71	0	0
Shingles,	M.	14049	5713	0	0				560	0	0	2728	0	0	22	0	0	2403	0	0
Staves and Hoops,			20348	0	0	232	0	0	1206	0	0	3018	0	0	214	0	0	15678	0	0
Spars and Knees,			9562	0	0	710	0	0	41	0	0	339	0	0	8352	0	0	120	0	0
Soap,			512	0	0				512	0	0									
Sugar,			50698	0	0	14597	0	0	34622	0	0				1451	0	0	28	0	0
Timber, (soft wood),			9213	0	0	4137	0	0	172	0	0				4943	0	0			
Do. (hard wood),			5728	0	0	4994	0	0	233	0	0				501	0	0			
Tea,	Lbs.	308119	21220	0	0				20954	0	0							266	0	0
Tobacco,			6901	0	0	100	0	0	6196	0	0				605	0	0			
Wine,			4232	0	0				3780	0	0	306	0	0	90	0	0	56	0	0
Wood,	Cords	48694	30577	0	0				3218	0	0	106	0	0	27237	0	0	16	0	0
Miscellaneous,			25889	0	0	2519	0	0	16167	0	0	544	0	0	6064	0	0	595	0	0
Totals,			£1247668	0	0	£117844	0	0	£413026	0	0	£270750	0	0	£318676	0	0	£127372	0	0

SAMUEL CREELMAN, Financial Secretary.

Financial Secretary's Office, March, 1855.

General Statement of Imports, showing the value of Merchandize entered at each Port in Nova Scotia, during the year 1854, and indicating from what country Imported.

Ports.	Total value.	Imported from											
		Great Britain.		British Colonies.				United States.			Other countries.		
				North America.		West Indies.							
Amherst,	£20072	0	0			£12393	0	0			£7679	0	0
Annapolis,	15585	0	0			9367	0	0	£83	0	0 6135	0	0
Antigonishe,	890	0	0			851	0	0			39	0	0
Arichat,	17789	0	0	£1488	0	0 4265	0	0			9419	0	0 2616	0	0
Barrington,	6067	0	0			899	0	0	100	0	0 5068	0	0
Beaver River,													
Big Bras d'Or,	288	0	0			288	0	0					
Canada Creek,	8054	0	0			3857	0	0			4197	0	0
Canso, (Cape,)	7779	0	0	600	0	0 5333	0	0			1846	0	0
Church Point,	7292	0	0			2028	0	0	290	0	0 4974	0	0
Clement's Port,	4260	0	0			2080	0	0			2180	0	0
Cornwallis,	6784	0	0			3543	0	0			3241	0	0
Digby,	24039	0	0			16893	0	0	99	0	0 7047	0	0
Guysborough,	1454	0	0			1454	0	0					
Halifax,	1359761	0	0	584531	0	0 198586	0	0	21923	0	0 344634	0	0 210027	0	0
Hantsport,	1886	0	0	619	0	0					1267	0	0
Horton,	9117	0	0			712	0	0			8190	0	0 215	0	0
Joggins,	2234	0	0			670	0	0			1564	0	0
LaHeve,	6014	0	0								6014	0	0
Liverpool,	18002	0	0	643	0	0 395	0	0	2052	0	0 13326	0	0 1586	0	0
Londonderry,	8906	0	0			2585	0	0			6321	0	0
Lunenburgh,	3228	0	0			667	0	0			2561	0	0
Maitland,	9915	0	0	100	0	0 1826	0	0			7939	0	0
Margaree,													
Parrsborough,	5784	0	0			3136	0	0			2598	0	0
Pictou,	65509	0	0	29532	0	0 7715	0	0			28262	0	0
Port Hood,	3404	0	0			292	0	0			3112	0	0
Port Medway,	2199	0	0						21	0	0 178	0	0
Pubnico,	4156	0	0			39	0	0			4117	0	0
Pugwash,	5429	0	0	2471	0	0 700	0	0			2258	0	0
Ragged Islands,	8590	0	0	10	0	0			2130	0	0		

Lar[illegible]ve,	6014	0	0																
Liverpool,	18002	0	0	643	0	0	395	0	0	2052	0	0	13326	0	0	1586	0	0	
Londonderry,	8906	0	0				2585	0	0				6321	0	0				
Lunenburgh,	3228	0	0				667	0	0				2561	0	0				
Maitland,	9915	0	0	100	0	0	1826	0	0				7939	0	0				
Margaree,																			
Parrsborough,	5734	0	0				3136	0	0				2598	0	0				
Pictou,	65509	0	0	29532	0	0	7715	0	0				28262	0	0				
Port Hood,	3404	0	0				292	0	0				3112	0	0				
Port Medway,	2199	0	0							21	0	0	178	0	0				
Pubnico,	4156	0	0				39	0	0				4117	0	0				
Pugwash,	5429	0	0	2471	0	0	700	0	0				2258	0	0				
Ragged Islands,	8590	0	0	10	0	0				2130	0	0	4990	0	0	1460	0	0	
Shelburne,	615	0	0				178	0	0	82	0	0	174	0	0	181	0	0	
Sherbrooke,	1768	0	0	1761	0	0							7	0	0				
Sheet Harbor,	33	0	0										33	0	0				
Ship Harbor,	8568	0	0				6558	0	0				2010	0	0				
Sydney, Cape Breton,	10656	0	0	2931	0	0	2512	0	0				3315	0	0	1898	0	0	
Tatamagouche,	304	0	0				53	0	0				251	0	0				
Thorne's Cove,	2269	0	0				1303	0	0				966	0	0				
Tusket,	3290	0	0							689	0	0	2601	0	0				
Wallace,	4345	0	0	4237	0	0							108	0	0				
Walton,	2843	0	0				156	0	0				2687	0	0				
Westport,	4670	0	0				2995	0	0	390	0	0	1285	0	0				
Weymouth,	7134	0	0				2022	0	0	217	0	0	4895	0	0				
Wilmot,	12705	0	0				9913	0	0				2792	0	0				
Windsor,	26029	0	0	6052	0	0	10169	0	0				9808	0	0				
Yarmouth,	71416	0	0	1850	0	0	13178	0	0	2057	0	0	53150	0	0	1181	0	0	
Totals,	£1791082	0	0	£636885	0	0	£329612	0	0	£30133	0	0	£575288	0	0	£219164	0	0	

Financial Secretary's Office, March, 1855.

SAMUEL CREELMAN, Financial Secretary.

General Statement of Exports, shewing the value of Merchandize exported from each port in Nova Scotia, during the year 1854, and indicating to what country exported.

Ports.	Total value.	Exported to				
		Great Britain.	British Colonies.		United States.	Other countries.
			North America.	West Indies.		
Amherst,	£4546 0 0	£2561 0 0	£555 0 0		£1430 0 0	
Annapolis,	23405 0 0	370 0 0	17572 0 0	£1380 0 0	4083 0 0	
Antigonish,	8312 0 0		8312 0 0			
Arichat,	19892 0 0		4823 0 0	1928 0 0	3251 0 0	£9890 0 0
Barrington,	8864 0 0		2010 0 0		6854 0 0	
Beaver River,						
Big Bras d'Or,	8080 0 0	305 0 0	7070 0 0			705 0 0
Canada Creek,	14520 0 0		4237 0 0		10283 0 0	
Canso (Cape,)	6018 0 0		4552 0 0		1466 0 0	
Church Point,	5701 0 0		810 0 0	1505 0 0	3386 0 0	
Clementsport,	4080 0 0		665 0 0		3415 0 0	
Cornwallis,	18477 0 0		2962 0 0		15515 0 0	
Digby,	15976 0 0	584 0 0	9285 0 0	600 0 0	5507 0 0	
Guysboro',	2061 0 0		2061 0 0			
Halifax,	739305 0 0	50494 0 0	267438 0 0	174429 0 0	147363 0 0	99581 0 0
Hantsport,	7917 0 0	4297 0 0	80 0 0		3540 0 0	
Horton,	12299 0 0		1652 0 0		10647 0 0	
Joggins,	5451 0 0		2562 0 0		2889 0 0	
LaHave,	9610 0 0		324 0 0	195 0 0	8796 0 0	295 0 0
Liverpool,	60929 0 0	1916 0 0	1178 0 0	45387 0 0	6183 0 0	6265 0 0
Londonderry,	7598 0 0	405 0 0	5253 0 0		1940 0 0	
Lunenburg,	5506 0 0			499 0 0	5007 0 0	
Maitland,	7921 0 0	769 0 0	2323 0 0		4829 0 0	
Margaree,						
Parrsboro',	7374 0 0	2093 0 0	1664 0 0		3617 0 0	
Pictou,	85713 0 0	10587 0 0	5964 0 0		19162 0 0	
Port Hood,	2174 0 0		274 0 0		1900 0 0	
Port Medway,	12336 0 0			6675 0 0	657 0 0	5004 0 0
Pubnico,	1925 0 0		853 0 0		1072 0 0	
Pugwash,	24702 0 0	23024 0 0	1678 0 0			
Ragged Islands,	19086 0 0			13286 0 0	5800 0 0	
Shelburne,						

Londonderry,	7598	0	0	405	0	0	5253	0	0	499	0	0	5007	0	0	
Lunenburg,	5506	0	0										4829	0	0	
Maitland,	7921	0	0	769	0	0	2323	0	0							
Margaree,													3617	0	0	
Parrsboro',	7374	0	0	2093	0	0	1664	0	0							
Pictou,	35713	0	0	10587	0	0	5964	0	0				19162	0	0	
Port Hood,	2174	0	0				274	0	0				1900	0	0	
Port Medway,	12336	0	0							6675	0	0	657	0	0	5004 0 0
Pubnico,	1925	0	0				853	0	0				1072	0	0	
Pugwash,	24702	0	0	23024	0	0	1678	0	0							
Ragged Islands,	19086	0	0							18286	0	0	3148	0	0	2652 0 0
Shelburne,	1969	0	0				449	0	0	1222	0	0	50	0	0	248 0 0
Sherbrooke,	3193	0	0	3193	0	0										
Sheet Harbor,	3480	0	0				3480	0	0							
Ship Harbor,	6844	0	0				3974	0	0				870	0	0	
Sydney, Cape Breton,	29184	0	0	535	0	0	15847	0	0				11218	0	0	1589 0 0
Tatamagouche,	5955	0	0	5346	0	0	609	0	0							
Thorne's Cove,	3889	0	0				667	0	0				3222	0	0	
Tusket,	3679	0	0							3301	0	0	378	0	0	
Wallace,	7037	0	0	6881	0	0	26	0	0	130	0	0				
Walton,	2661	0	0	822	0	0							1839	0	0	
Westport,	7760	0	0	1100	0	0	2960	0	0	588	0	0	3112	0	0	
Weymouth,	16359	0	0	854	0	0	910	0	0	9656	0	0	4238	0	0	691 0 0
Wilmot,	19371	0	0				15344	0	0				4027	0	0	
Windsor,	16671	0	0	1708	0	0	6142	0	0				8821	0	0	
Yarmouth,	19838	0	0				4461	0	0	9959	0	0	4966	0	0	452 0 0
Totals.	£1247668	0	0	£117844	0	0	£413026	0	0	£270750	0	0	£318676	0	0	£127372 0 0

Financial Secretary's Office, March, 1855.

SAMUEL CREELMAN, Financial Secretary.

Return of the number, tonnage, and value of Vessels built at the following Ports in Nova Scotia, during the Year 1854, and if sold, whither sent for sale.

Ports.	Vessels built in 1854.			Whither sent for sale.								
				Great Britain.			British Colonies.			United States.		
	No.	Ton'ge.	Value.	No.	Ton'ge.	Value.	No.	Ton'ge.	Value.	No.	Ton'ge.	Value.
Amherst,	3	1243	£12500 0 0	1	668	£6500 0 0						
Annapolis,	8	2060	16800 0 0	3	480	3900 0 0	2	150[illegible]	[illegible]500 0 0			
Antigonishe,	7	938	7360 0 0				2	[illegible]	2200 0 0			
Arichat,	4	319	2000 0 0									
Barrington,	8	662	5500 0 0	3	433	3200 0 0						
Bras d'Or,	2	342	2800 0 0	2	342	2800 0 0						
Canada Creek,	4	1340	9400 0 0				3	[illegible]	3000 0 0			
Cape Canso,	2	216	1850 0 0									
Church Point,	1	170	1400 0 0									
Clementsport,	1	119	1600 0 0									
Digby,	5	2546	17445 0 0				4	2440	16445 0 0			
French Cross,	1	157	2000 0 0									
Guysborough,	6	686	5750 0 0									
Halifax,	3	916	10850 0 0	No return of sales.								
Hantsport,	1	231	2200 0 0				1	170	1250 0 0			
Harbor au Bouche,	2	162	1600 0 0									
Horton,	2	198	2050 0 0									
Joggins,		Nil.										
Liverpool,	8	2229	32050 0 0				1	138	2000 0 0			
Londonderry,	6	637	7850 0 0							1	82	£450 0 0
Lunenburg County,	19	1187	15400 0 0									
McNair's Cove,	1	57	500 0 0									
Maitland,	3	418	3650 0 0				1	122	300 0 0			
Margaree,	3	92	600 0 0									
Parrsborough,	4	346	2500 0 0				1	104	800 0 0			
Pictou,	27	7895	79750 0 0	8	1500	11924 0 0	1	78	625 0 0			
Port Hood,		Nil.										
Port Medway,	4	554	3300 0 0									
Pubnico,	2	133	1200 0 0	4	1239	13820 0 0						
Pugwash,	4	1239	13820 0 0									
Ragged Islands,	2	168	2100 0 0									
Sandy Cove,	1	150	950 0 0									

Liverpool,	8	2229	32050	0	0					1	138	2000	0	0	1	82	£450	0	0
Londonderry,	6	637	7850	0	0														
Lunenburg County,	19	1187	15400	0	0														
McNair's Cove,	1	57	500	0	0					1	122	300	0	0					
Maitland,	3	418	3650	0	0														
Margaree,	3	92	600	0	0					1	104	800	0	0					
Parrsborough,	4	346	2500	0	0														
Pictou,	27	7895	79750	0	0	8	1500	11924	0	0	1	78	625	0	0				
Port Hood,		Nil.																	
Port Medway,	4	554	8300	0	0														
Pubnico,	2	133	1200	0	0	4	1239	13820	0	0									
Pugwash,	4	1239	13820	0	0														
Ragged Islands,	2	168	2100	0	0														
Sandy Cove,	1	150	950	0	0														
Saint Mary's,	8	1096	9800	0	0	2	722	6500											
Saint Ann's,	1	230	1500	0	0														
Sheet Harbor,	1	275	3000	0	0														
Ship Harbor,	2	150	1500	0	0														
Shelburne,	6	780	10500	0	0					1	100	2000	0	0					
Sydney, Cape Breton,	15	1946	17275	0	0	1	244	2500	0	0	1	110	400	0	0				
Sydney, North,	3	913	7750	0	0														
Tatamagouche,	8	1958	16372	0	0	6	1783	14472	0	0	2	205	1900	0	0				
Thorne's Cove,	1	350	2500	0	0						1	350	2500	0	0				
Truro,	1	443	3500	0	0														
Tusket,	6	500	3798	0	0														
Walton,	1	76	900	0	0														
Wallace,	14	4778	51360	0	0	11	4363	46460	0	0	3	415	4900	0	0				
Westport,		Nil.																	
Weymouth,	8	3537	22970	0	0						5	2826	17970	0	0				
Wilmot,	2	295	2700	0	0														
Windsor,	4	1824	15960	0	0														
Yarmouth Township.	18	6253	66659	0	0														
	244	52814	£509319	0	0	41	11674	£112076	0	0	26½	9369	£66790	0	0	1	82	£450	0	0

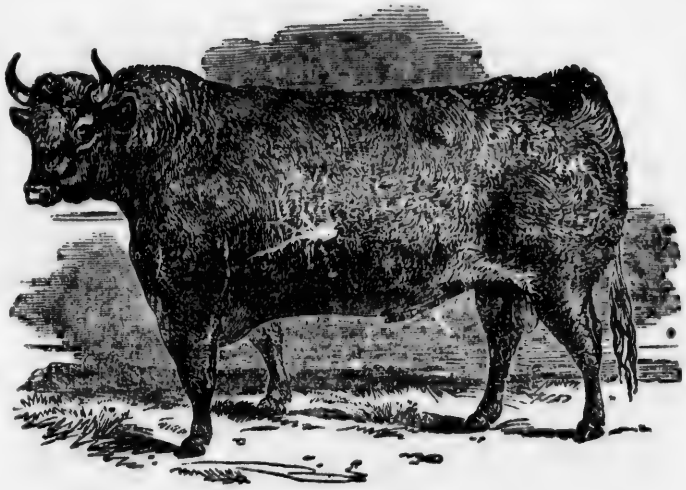
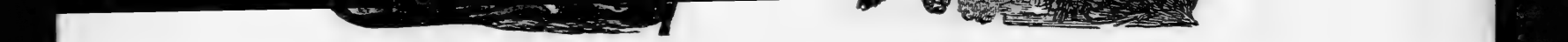


Fig. 3. DEVON BULL.

Fig. 4. DEVON COW.



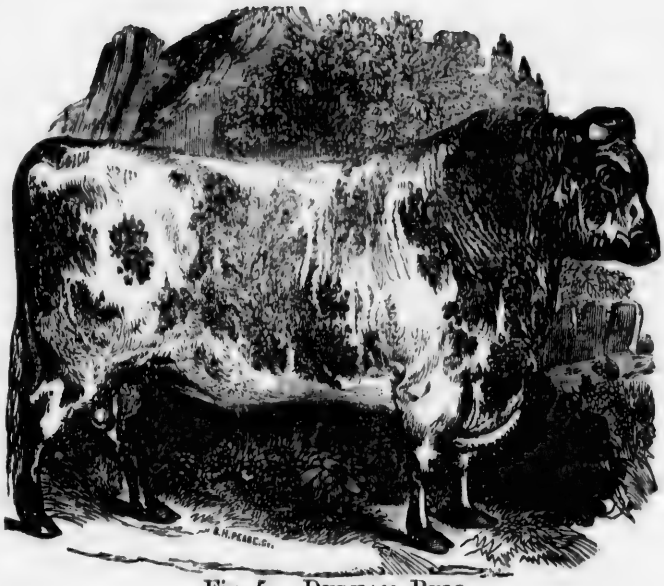


Fig. 5. DURHAM BULL.

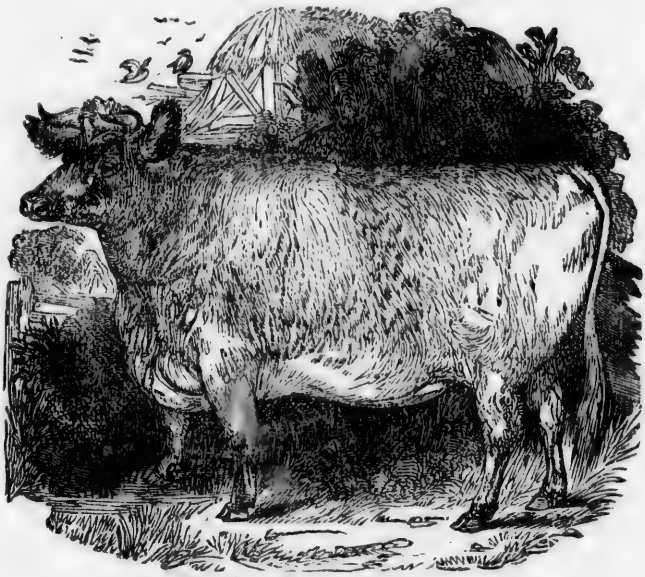


Fig. 6. DURHAM HEIFER.

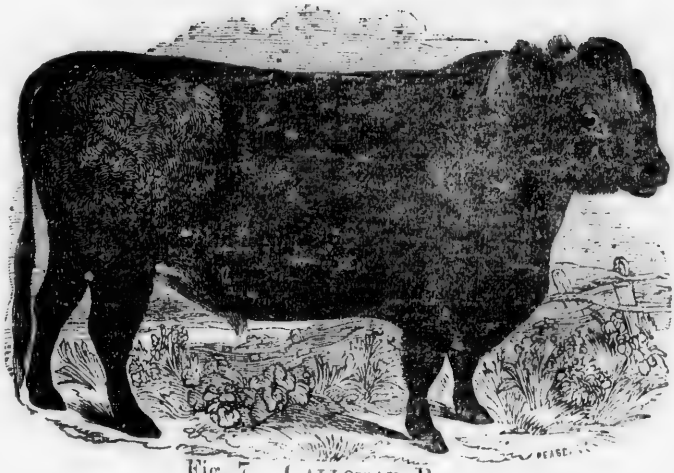


Fig. 7. Galloway Bull.

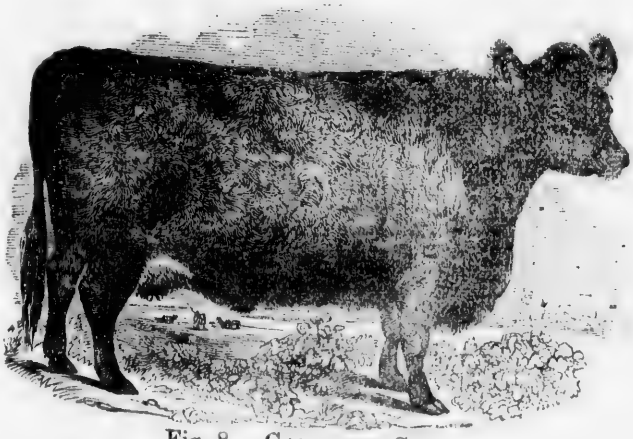


Fig. 8. Galloway Cow.

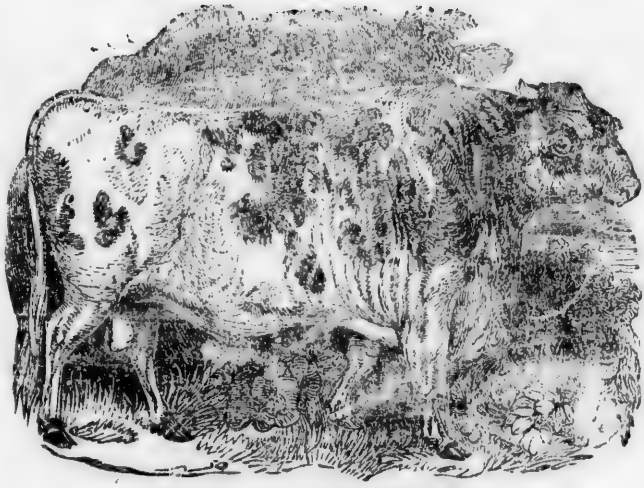


Fig. 9. POLLED SUFFOLK BULL.

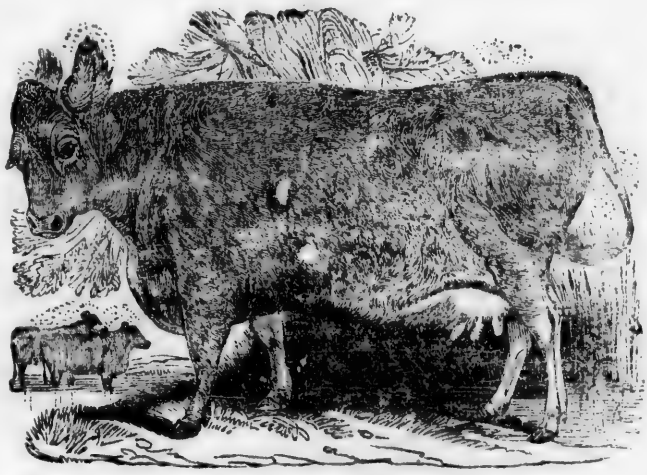


Fig. 10. POLLED SUFFOLK COW.


R.G.GILBERT

Fig. 11. AYRSHIRE BULL.

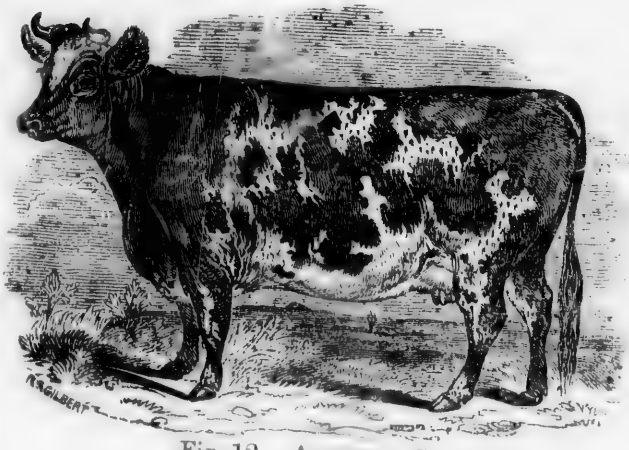


Fig. 12. AYRSHIRE COW.

INDEX.

ERRATA.

Page 23—For *Alumini* read *Alumina*.
" 27—For *Sulphurate* read *Sulphate*.
" 29—For *or* other rocks read *of* other rocks.
" 30—For *Draining* read *Drainage*.
" 32—For *Sulphate of Soda* read *Sulphates of Lime and Magnesia*.